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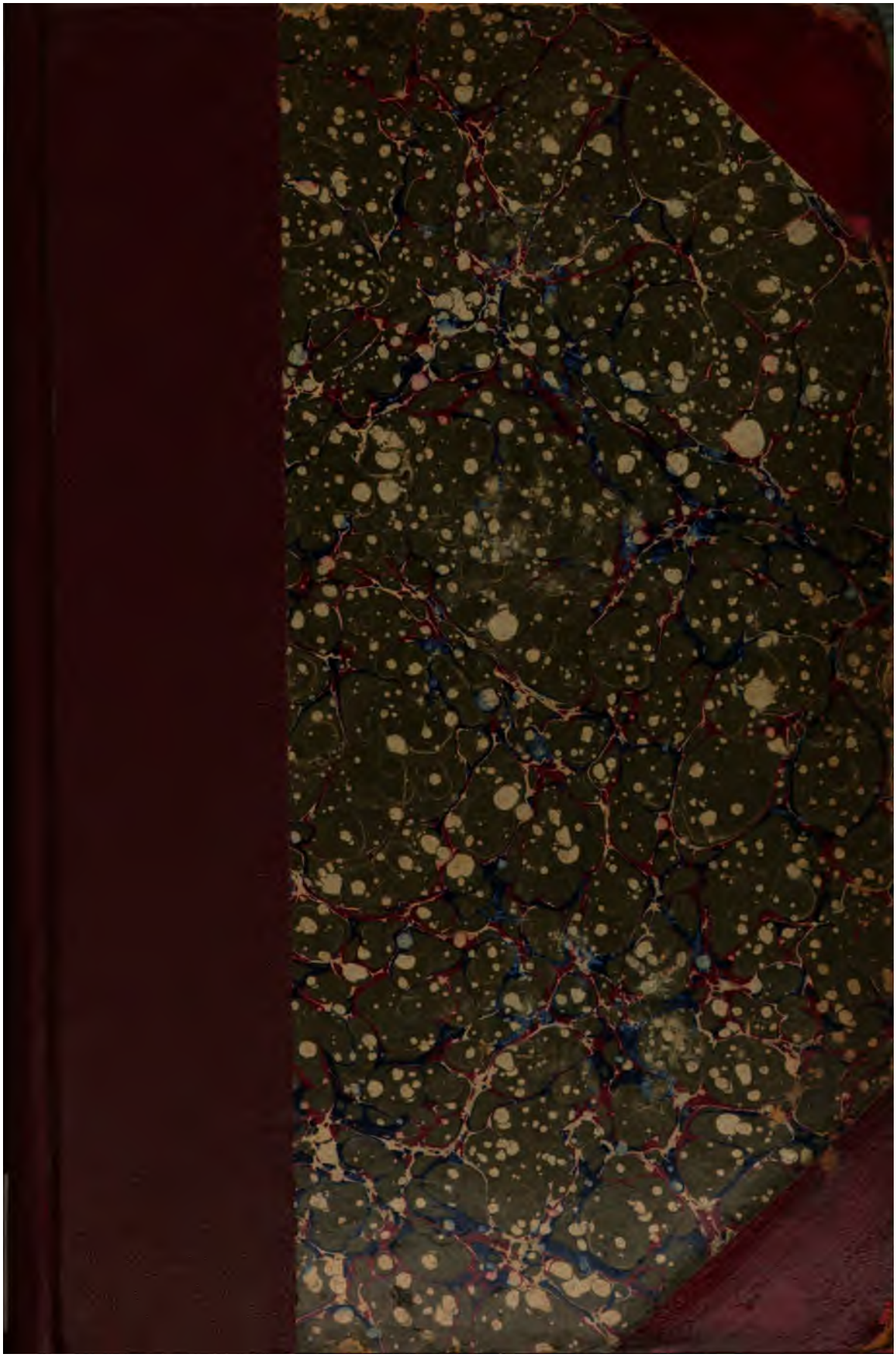

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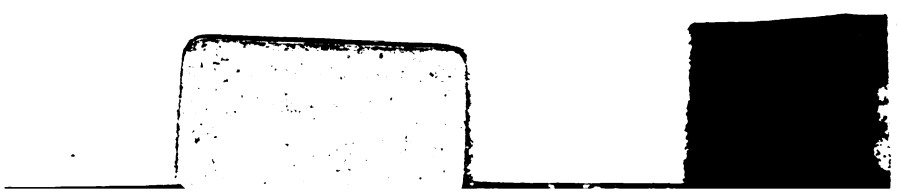

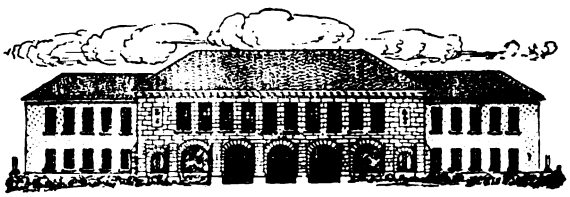

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herausgegeben von

Rud. Virchow und Fr. v. Holtzendorff.

IV. Serie.
(Heft 73 — 96 umfaſſend.)

Heft 73.

Der Farbenſinn.

Von

Dr. Albrecht Nagel,
Profeſſor der Augenheilkunde zu Tübingen.

Mit 1 Holzſchnitt.

Berlin, 1869.
C. G. Lüderitz'ſche Verlagsbuchhandlung.
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Der Farbenſinn.

Populär-wiſſenſchaftlicher Vortrag, im November 1868 zu Tübingen gehalten

von

Dr. Albrecht Nagel,
Profeſſor der Augenheilkunde zu Tübingen.

Berlin, 1869.
C. G. Lüderitz'ſche Verlagsbuchhandlung.
A. Charisius.

Das Recht der Ueberſetzung in fremde Sprachen wird vorbehalten.

Das Weſen der Farbe, wie des Lichtes überhaupt, iſt viele Jahrhunderte lang ein ungelöſtes Räthſel geblieben; gegenwärtig bildet die Wiſſenſchaft, welche mit beiden ſich beſchäftigt, einen der erſten Glanzpunkte der geſammten Naturwiſſenſchaft. Die Lehre von den Sinnesthätigkeiten bildet ein Grenzgebiet dreier großer und wichtiger Wiſſenſchaften, welche ihre Reſultate hier gewiſſermaßen austauſchen und concentriren. In jede dieſer drei Wiſſenſchaften werden wir, wenn wir heute den Farbenſinn kennen lernen wollen, einen Blick thun müſſen. Die Phyſik muß uns über die Natur des farbigen Lichtes belehren, die Phyſiologie über das Organ des Körpers, welches zur Aufnahme und Unterſcheidung farbigen Lichtes geeignet iſt; da endlich die Farben ſubjective Erſcheinungen ſind, Empfindungen, alſo pſychiſche Vorgänge, ſo wird die Pſychologie als letzte Inſtanz hierüber zu hören ſein.

Vom grauen Alterthum an bis in die neueſte Zeit hinein iſt man immer von Neuem auf den Verſuch zurückgekommen, die Farben aus der Miſchung von Licht und Finſterniß, von Hellem und Trübem abzuleiten. So ſchön und poetiſch der Gedanke iſt, „des Frühlings luſt'ge Boten" von jenem uralten Elternpaar, das im erſten Moment der Schöpfung ſeine Vermählung feierte, abſtammen zu laſſen,

Die Mutter ewig ernſt und düſter
Der Vater fröhlich immerdar,

ſo wenig können wir das der Wirklichkeit und wiſſenſchaftlichen Anforderungen entſprechend finden. Die zahlreichen Verſuche auf jenem unſicheren Fundamente eine Farbenlehre aufzubauen, von Ariſtoteles an bis auf Goethe, haben ſich denn auch als gänzlich verfehlt erwieſen. Es war einer der erſten Forſcher aller Zeiten, Newton, der Entdecker des Gravitationsgeſetzes, der vor zwei Jahrhunderten zuerſt eine Farbentheorie auf ſtreng wiſſenſchaftlicher Baſis errichtete und dadurch für die phyſikaliſche und phyſiologiſche Farbenlehre den ſoliden Grund legte.

Wir wiſſen, daß die Empfindung verſchiedener Farben auf Erregung unſeres Sehorgans durch verſchieden beſchaffenes Licht zurückzuführen iſt, daß ſomit die Farbe von zwei ſehr verſchiedenen Dingen abhängt, nämlich nicht bloß von einer außer uns befindlichen Urſache, ſondern zugleich von unſerer eigenen Organiſation. Mit beiden Factoren müſſen wir uns alſo näher bekannt machen.

Zur Erklärung der Phänomene des Lichts hat ſich eine mit bewundernswerthem Scharfſinn durchgeführte Theorie als vorzüglich geeignet erwieſen, welche das Licht als eine äußerſt feine ſchwingende Bewegung der kleinſten Theilchen eines den ganzen Weltraum, den ſogenannten leeren ſowohl als den mit Körpern erfüllten Raum durchdringenden imponderablen Aethers betrachtet. Gegen die Vorausſetzung eines ſolchen nicht direct nachweisbaren Aethers ſind allerdings in neueſter Zeit gewichtige Einwendungen erhoben worden. Eine neue Theorie ſucht alle Erſcheinungen der Wärme und des Lichts aus Schwingungen zu erklären, welche nicht der allgegenwärtige Aether macht, ſondern die Subſtanz ſelbſt, die Moleküle der Körper und eines unendlich verdünnten den geſammten Weltraum erfüllenden Mediums, das der körperlichen Eigenſchaften keineswegs entbehrt. Doch dieſe Differenz iſt für uns von geringem Belange; uns genügt es zu wiſſen,

was unbestritten ist, daß die Ursache aller Lichterscheinungen in schwingender, wellenförmig sich fortpflanzender Bewegung besteht, mag diese nach der bisherigen Auffassung nun den Aether betreffen, oder nach der Molekulartheorie die körperlichen Theilchen selbst.

Ein leuchtender Körper verbreitet sehr verschiedene Vibrationsbewegungen um sich, wellenförmige Schwingungen von sehr verschiedener Länge der einzelnen Wellen. Nur einen kleinen Theil dieser Wellenzüge von bestimmter, innerhalb fester Grenzen wechselnder, Wellenlänge nennen wir Licht, einen viel größeren Theil mit größerer Wellenlänge nennen wir strahlende Wärme, einen anderen mit geringerer Wellenlänge chemische Strahlen. Nur die Strahlen, deren Wellenlänge ungefähr zwischen 400 und 800 Milliontheilen eines Millimeters beträgt, bilden einen angemessenen Reiz für die Netzhaut des Auges und rufen je nach dem Betrage dieser Wellenlänge verschiedene Farbenempfindungen hervor.

Da die Geschwindigkeit, mit welcher die wellenförmigen Bewegungen in gewissen Medien sich fortpflanzen, für verschiedene Lichtstrahlen ungleich ist, so gewährt uns das ein Mittel die verschiedenartigen Strahlen zusammengesetzten Lichtes von einander zu scheiden. Ein Prisma aus einem Stoffe, welcher Strahlen verschiedener Wellenlänge in sehr ungleichem Grade verzögert, z. B. Flintglas, setzt uns in den Stand, alle Lichtstrahlen gesondert zur Erscheinung zu bringen und ihre Einwirkung auf unser Sehorgan zu erproben. Das bekannte prismatische Spectrum des Sonnenlichts lehrt uns, daß Strahlen von verschiedener Wellenlänge sehr differente Farbenempfindungen hervorrufen.

Vom Regenbogen her, der ja ein durch Lichtbrechung innerhalb der in der Luft enthaltenen Regentropfen erzeugtes großartiges Sonnenspectrum uns vor Augen führt, kennen wir sechs oder sieben Hauptfarben, Roth, Orange, Gelb, Grün, Blau, Violet. Das Blau nimmt einen verhältnißmäßig breiten Raum

im Spectrum ein und zeigt zwei ſo weſentlich verſchiedene Abtheilungen, daß man es ſchon von Alters her in zwei Farben getheilt hat, Hellblau und Dunkelblau. Da dieſe Namen aber nicht bezeichnend genug ſind und zu Mißverſtändniſſen Anlaß geben können, zieht man es jetzt vor, beide Farben nach gewiſſen in der Natur vorkommenden Farbſtoffen zu benennen, Cyanblau und Indigoblau. Dadurch wird die Zahl der Hauptfarben von ſechs auf ſieben erhöht und wir können dieſe Zahl noch um zwei weitere Farben vermehren, wenn wir die äußerſten Enden des Spectrums genauerer Betrachtung unterwerfen. Auf beiden Enden ſehen wir nämlich das farbige Licht nicht mit ſcharfer Grenze aufhören, die Intenſität der Endfarben Roth und Violet nimmt vielmehr allmählig ab, die Farbe wird immer ſchwächer und undeutlicher, bis ſie zuletzt ganz verſchwindet. Das durch die hell leuchtenden Farben, namentlich des mittleren Spectral-Abſchnitts erregte und geblendete Auge iſt für die ſchwachen Eindrücke der Enden weniger empfänglich als das ausgeruhte Auge, welches keine hellere Stelle in ſeinem Sehfelde hat. Trifft man daher Vorkehrung, um das Auge vor dem Einfall der grellen Spectralfarben zu ſchützen und die Enden iſolirt zur Anſchauung zu bringen, ſo ſieht man das Spectrum an jeder Seite, beſonders aber an der violetten Seite, um ein gutes Stück länger, man entdeckt zwei ſchwache Farbeneindrücke, die man früher neben der reichen Pracht des Ganzen überſehen hatte. Die auf dem äußerſten Ende des Roth befindlichen ſogenannten ultrarothen Strahlen machen auf das Auge den Eindruck einer lichtſchwachen röthlichen Farbe, die wir Braun nennen, die am anderen Ende des Spectrums auftretenden ultravioletten Strahlen erregen eine unbeſtimmte Farbenempfindung, die man als Lavendelgrau bezeichnet. Von letzteren Strahlen weiß man, daß ſie eine ſtarke chemiſche Wirkung

üben, die ersteren übertreffen den übrigen Theil des Spectrums durch ihre Wärmewirkung.

So wenig wie die Farben der beiden Enden, so wenig zeigen auch die Farben der Mitte des Spectrums eine scharfe Abgrenzung gegen einander. Im Gegentheil erfolgt der Uebergang stets ganz allmählig durch eine große, ja genau genommen unendlich große Menge von Mittel- oder Zwischentönen, die im Auge deutlich unterscheidbare Empfindungen hervorrufen. So geht z. B. das Gelb in das Grün nicht plötzlich über, sondern durch unzählige Zwischenstufen, die wir summarisch Gelbgrün, Grüngelb nennen, für deren feinere Abstufungen uns aber der sprachliche Ausdruck fehlt. Dennoch ist die Aufstellung der Hauptfarben keineswegs eine willkürliche, worauf uns schon die Gemeinsamkeit der sprachlichen Bezeichnung bei fast allen Völkern hinweist. Lange wußte man sich über die Ursache der Unterschiede der Hauptfarben keine Rechenschaft zu geben, am wenigsten objective Unterschiede zwischen dem Lichte der Hauptfarben zu bezeichnen. In neuester Zeit jedoch ist ein Umstand aufgedeckt worden, der auch hier, in der Welt der Farbe, Regel und Gesetz, Maaß und Zahl erkennen läßt. Ein deutscher Physiker von großen Verdiensten um die physiologische Optik, Professor Listing in Göttingen, hat festgestellt, daß gerade wie bei den Tönen der musikalischen Scala, so auch in der Farbenscala die Zahlen, welche die Häufigkeit der Schwingungen in der Zeiteinheit angeben, eine wichtige Rolle spielen, überraschende Beziehungen zeigen. Die Schwingungszahlen der Hauptfarben schreiten in der Weise fort, daß je zwei auf einander folgende Glieder der Reihe einen constanten Unterschied zeigen. Eine solche Folge von Zahlen nennt man eine arithmetische Reihe. Der constante Unterschied, welcher unter den Schwingungszahlen der Farbenreihe jedes Glied von dem nächstfolgenden trennt, beträgt nicht viel weniger als 50 Billionen.

Wenn z. B. die rothen Lichtſtrahlen 436 Billionen Schwingungen in einer Sekunde machen, ſo machen die orangefarbenen Strahlen deren 48½ Billionen mehr, nämlich 485 Billionen, die gelben Strahlen wieder 48½ Billionen mehr, d. h. 533 Billionen, und ſo fort. Wenn man dieſe ungeheuren Zahlen, die für unſere Vorſtellung ja doch völlig unfaßlich ſind, möglichſt reducirt, indem man jenen conſtanten Unterſchied von 48½ Billionen als Einheit betrachtet, ſo gewinnt man für die Farbenſcala von Braun, Roth u. ſ. w. bis Violet und Lavendelgrau die Zahlenreihe 8, 9, 10 u. ſ. w. bis 16, alſo höchſt einfache Repräſentanten für die Schwingungszahlen der Hauptfarben.

Beachtet man, daß die letzte Zahl (16), welche dem Lavendelgrau entſpricht, gerade das Doppelte der erſten (8) iſt, welche dem Braun zugehört, ſo erkennt man einen intereſſanten Gegenſatz gegen die muſikaliſche Tonreihe. Auch die muſikaliſchen Töne werden durch regelmäßige Schwingungen erzeugt, freilich von anderer Art und namentlich von unendlich verſchiedener Größe. Die Schwingungszahlen dienen aber auch zur Charakteriſirung der Töne, und wenn die Schwingungszahl eines Tons das Doppelte der Schwingungszahl eines anderen Tons iſt, ſo nennen wir den erſteren die Octave des letzteren. Somit ſehen wir, während das Ohr mehr als ſieben, ja wenn wir die äußerſten in der Muſik nicht mehr brauchbaren Töne mitrechnen, faſt zehn Octaven von Tönen unterſcheidet, ſo iſt das höchſte Maaß für die Ausdehnung des Farbenunterſcheidungsvermögens nur eine Octave, ſelbſt wenn wir jene zweifelhaften Endfarben Braun und Lavendelgrau mit einſchließen, denen wir kaum das Bürgerrecht in dem Regiſter der einfachen Farben gewähren mögen.

Doch noch zu anderen Betrachtungen regt die Vergleichung der Farben- und Tonleiter an. Wollte man eine Tonreihe erklingen laſſen, welche in der Aufeinanderfolge der Schwingungszahlen

sich denen der Farbenscala genau anschließt, so würden musikalisch gebildete Ohren wahrscheinlich höchst unangenehm davon berührt werden. Der Grund liegt darin, daß für die musikalische Tonfolge ganz andere Verhältnisse maßgebend sind. Nicht von der Differenz der Schwingungszahlen auf einander folgender Glieder hängt der Wohlklang der Tonreihe ab, sondern von dem Quotienten. Während die Schwingungszahlen der Farbenscala eine arithmetische Reihe bilden, stellt die musikalische Tonscala eine sogenannte geometrische Reihe dar. Mit dieser Erkenntniß fallen viele unbegründete Beziehungen und Aehnlichkeiten, die man zwischen Ton und Farbe in ziemlich gewaltsamer und gezwungener Weise aufgestellt hat. Will man den Ausdruck Harmonie von den Tönen auf die Farben übertragen, so muß man sich bewußt sein, daß, was man darunter zu verstehen hat, zwei sehr verschiedene Dinge sind, und daß die Gesetze der einen Harmonie sich nicht ohne Weiteres auf die andere Harmonie übertragen lassen.

Wir haben gesehen, wie groß die Zahl der Farbenempfindungen sich schon herausstellt, wenn wir nur die einfachen Farben des prismatischen Spectrums mit ihren zahllosen Uebergängen in Berechnung ziehen. Nun aber bilden gerade diese reinen und schönen Farben den weitaus geringsten Theil derjenigen, die wir wahrzunehmen gewohnt sind. Was wir, sobald wir die Augen aufschlagen, um uns her erblicken, sind die vielfältigsten Mischfarben, Empfindungen, welche hervorgehen aus der Vereinigung der verschiedensten Lichtsorten, die gleichzeitig das Auge treffen und die Netzhaut erregen. Leuchtende Körper senden Lichtstrahlen aus von sehr verschiedener Wellenlänge, in den verschiedensten Gemischen. Die nicht selbstleuchtenden Körper hingegen verhalten sich unendlich verschieden gegen die Lichtstrahlen, von welchen sie beleuchtet werden. Einen großen Theil verschlucken (absorbiren) sie, verwandeln dabei die Lichtbewegung in eine andere

Art innerer Bewegung, nur einen Theil, bald einen größeren, bald geringeren, werfen sie zurück, werden uns dadurch sichtbar und erscheinen uns gefärbt, je nach dem Vorwalten der oder jener Sorte Licht, welche sie von dem erhaltenen zurückgeben.

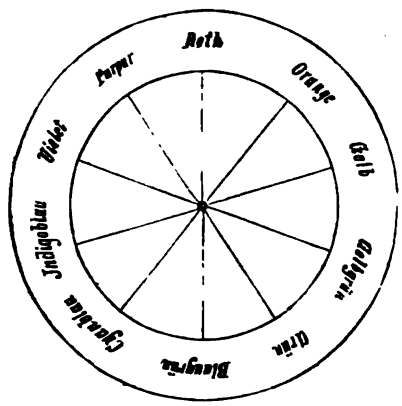
So unberechenbar mannigfaltig nun die in der Natur vorkommenden Lichtgemische sind, so sind es auch die daraus entspringenden Farbenempfindungen. Dennoch aber finden wir unter den Mischfarben nur eine ganz kleine Anzahl solcher, die ganz neue, ihrem Charakter nach von den einfachen Farben wesentlich verschiedene Farben darstellen. Eine solche Mischfarbe ist vor Allem das Weiß, eine so eigenartige und reine Empfindung, daß es uns Mühe kostet, uns an den Gedanken zu gewöhnen, Weiß sei eine Mischung verschiedenfarbigen Lichtes. Auch Goethe's hartnäckiger, von manchen Nachfolgern und Anhängern noch bis heute fortgesetzter Widerstand gegen Newton's Farbenlehre wurzelte in der Abneigung die Zusammensetzung des weißen Sonnenlichtes aus Farben anzuerkennen. Und dennoch lehrt uns das strengste Controlmittel der Naturwissenschaft, das Experiment, daß dem so sei. Die Empfindung des Weiß, so einfach, so primitiv sie uns erscheint, ist etwas auf sehr verschiedene Weise Zusammengesetztes. Nicht nur alle Farben des zerlegten Sonnenspectrums geben, wenn sie wiedervereinigt werden, Weiß, auch viele andere Mischungen können ganz das nämliche Resultat liefern. Ja, für jede einfache Spectralfarbe giebt es eine zugehörige in einem anderen Theile des Spectrums, mit welcher in richtiger Proportion vereinigt, sie Weiß erzeugt. Zwei Farben, die sich in dieser Weise zu Weiß ergänzen, nennt man complementäre oder Ergänzungsfarben. Roth und Blaugrün, Orange und Violet, Gelb und Indigoblau sind solche complementäre Farbenpaare, deren es aber unzählige giebt. Wir werden später eine physiologische Erklärung für dies Verhältniß gewinnen, wollen aber gleich jetzt be-

achten, daß für das Auge diese verschiedenartigen Gemische einen durchaus identischen Eindruck machen, daß es künstlicher Hülfsmittel, z. B. eines Glasprismas, bedarf, um die ungleiche Zusammensetzung des verschiedenen Weiß zu erkennen. Anders verhält es sich bekanntlich mit dem Ohre, welches, namentlich wenn es musikalisch geübt ist, sehr wohl die Fähigkeit besitzt, die gleichzeitig erklingenden Töne der Accorde einzeln zu unterscheiden. Uebrigens kennen wir aber auch im Gebiet des Gehörsinnes Mischempfindungen, deren Bestandtheile sich nicht direct wahrnehmen lassen, sondern zu einer scheinbar einfachen Empfindung zusammenschmelzen. Daß z. B. die verschiedenen Klänge der Vokale in dem gleichzeitigen Ertönen verschiedener consonirender Obertöne ihren Grund haben, vermag auch das schärfste und geübteste Ohr nicht unmittelbar zu hören.

Nur eine zusammengesetzte Farbe ist noch zu nennen, welche sich an Reinheit und Schönheit mit den einfachen Spectralfarben zu messen im Stande ist, die Purpurfarbe, die Mischung von Roth und Violet. Im Spectrum kommt der Purpur nicht vor, aber wir bedürfen seiner zur Vervollständigung der Zahl der reinen Farbentöne, zur Schließung des Farbenkreises, wenn wir uns die einfachen Farben auf der Peripherie eines Kreises angeordnet denken. Purpur bildet dann den Uebergang zwischen den reinen Endfarben des Spectrums, Roth und Violet.

Alle weiteren Mischfarben, welche es nun noch giebt, sind in ihrem Charakter von den bisher erwähnten vergleichsweise nur wenig verschieden. Die Vereinigung zweier oder mehrerer einfacher Lichtarten liefert eine Empfindung, welche von einer durch gewisses einfaches Licht erzeugbaren Empfindung nur durch eine weißliche Beimischung abweicht. Rothes und grünes Licht z. B. erzeugt gemischt die Empfindung Gelb, welche sich von dem einfachen Gelb des Spectrums höchstens durch ein weißliches Aus-

ſehen oder, wie man ſich gewöhnlich ausdrückt, durch geringere Sättigung unterſcheidet. Das Geſetz, nach dem die Miſchfarben entſtehen, iſt ein ſehr einfaches. Man denke ſich die Spectralfarben mit Einſchluß des das Roth und Violet verbindenden Purpur im Kreiſe ſo angeordnet, daß immer die complementären Farben einander gegenüber an den beiden Enden eines Kreisdurchmeſſers ſtehen. Alsdann ergiebt die Miſchung zweier einfacher Farben jedesmal die auf dem kleineren Kreisbogen zwiſchen ihnen ungefähr in der Mitte liegende Farbe mit einer Beimiſchung von Weiß, die um ſo ſtärker iſt, je weiter auf dieſem kleinen Kreisbogen die Farben von einander abſtehen.



Das Experiment beſtätigt dies. Es giebt verſchiedene Mittel, farbiges Licht zu miſchen, d. h. gleichzeitig auf dieſelbe Stelle der Netzhaut einwirken zu laſſen. Einmal kann man Vorrichtungen treffen, um beſtimmte Theile zweier prismatiſcher Spectra direct zur Deckung zu bringen. Eine andere einfache Methode beſteht darin, die zu miſchenden Farben auf einer drehbaren kreisförmigen Scheibe in paſſender Vertheilung anzubringen. Bei ſchneller Rotation der Scheibe oder des Farbenkreiſels, wie man einen ähnlichen Apparat nennt, folgen ſich die Eindrücke der verſchiedenen Farben auf der Netzhaut ſo ſchnell, daß ſie in der Empfindung vollſtändig verſchmelzen. Man darf indeſſen nicht glauben, durch Miſchung von Farbſtoffen in feſter oder flüſſiger

Form daſſelbe erreichen zu können, denn dabei wirken ganz andere Umſtände mit. An einem Beiſpiel iſt dies beſonders auffallend. Gelbes und blaues Licht aus dem prismatiſchen Spectrum ſind complementäre Farben, vereinigt geben ſie weiß. Auch auf der rotirenden Farbenſcheibe ſehen wir ein möglichſt reines Gelb und Indigo-blau wenigſtens ein helles Weiß-grau bilden, wenn auch wegen der Unreinheit aller in der Natur vorkommenden Farbſtoffe kein ganz reines Weiß. Wenn wir aber den gelben und den blauen Farbſtoff direct miſchen, wie es der Maler auf der Palette thut, ſo ſehen wir nimmermehr Weiß entſtehen, ſondern bekanntermaßen Grün. Hier erfolgt nämlich keine Vereinigung und Summirung des gelben und blauen Lichtes, das die gelben und blauen feinſten Theilchen ausſenden, ſondern im Gegentheil, jedes der übereinander geſchichteten Theilchen nimmt dem andern noch etwas fort, die blauen Theilchen den gelben, die gelben den blauen. Durch Verſchlucken (Abſorption) verſchwindet ein Theil des Lichtes und nur das von beiden nicht abſorbirte grüne Licht, welches ſowohl die blauen als die gelben Theilchen in ziemlicher Menge ausſenden, bleibt übrig und wird ſichtbar. Deshalb erſcheint auch die grüne Miſchfarbe nicht heller als die Beſtandtheile, ſondern dunkler, denn es geht ja Licht verloren. Bei allen Farbſtoffmiſchungen verhält es ſich ähnlich, wenn auch der Unterſchied nicht immer ſo in die Augen fällt wie in dem Beiſpiel von gelb und blau.

Nun giebt es endlich noch Unterſchiede der Farbenempfindungen, welche durch ungleiche Lichtſtärke oder Intenſität der Farben erzeugt werden, und man bezeichnet danach die Farben als helle oder dunkle. Hellroth z. B. iſt eine lichtſtärkere Farbe als dunkelroth, dunkelgrün eine lichtſchwächere als hellgrün. Für manche ſolche Unterſchiede oder Schattirungen hat man beſondere Namen. Braun z. B. nennen wir ein lichtſchwaches Orange oder Roth, grau nennen wir ein lichtſchwaches Weiß, gelb-grau ein

lichtſchwaches weißliches Gelb u. ſ. w. Auch Schwarz, wiewohl es eigentlich nur Mangel an Licht bedeutet, müſſen wir, da es immerhin eine beſtimmte Empfindung liefert, als Farbe gelten laſſen. Wie ſich die Unterſchiede der Sättigung durch Beimiſchung eines gewiſſen Quantums Weiß zur einfachen Farbe ausdrücken laſſen, ſo kann man die Unterſchiede der Helligkeit als Beimiſchung eines gewiſſen Quantums Schwarz bezeichnen, und wenn endlich die Miſchfarbe von der einfachen Spectralfarbe ſowohl durch den Grad der Sättigung als den Grad der Helligkeit abweicht, ſo können wir das als Zumiſchung von Weiß ſowohl als Schwarz d. h. alſo von Grau auffaſſen. Auf ſolche Weiſe ſehen wir eine wahrhaft endloſe Menge von Farbentönen, Nüancen und Schattirungen vor uns ſich entwickeln, aber alle ohne Ausnahme laſſen ſich auf eine kleine Zahl von Hauptfarben zurückführen. Wir werden ſogleich ſehen, daß in unſerem Sinnesorgane noch eine weitere ſehr merkwürdige Reduktion Platz greift.

Werfen wir die Frage auf, wie die qualitativen Unterſchiede des Lichtes, welche wir Farben nennen, zu unſrer Wahrnehmung gelangen, ſo erhalten wir von der Phyſiologie auch heute noch keineswegs eine befriedigende Antwort. Sie vermag den Weg im Einzelnen noch nicht anzugeben, auf dem die Wellenbewegung des Lichtes ſich in Geſichtseindrücke umſetzt, auf dem die objectiven Unterſchiede von Wellenlänge und Schwingungsdauer auf die Nerven einwirken und in der Empfindung als Farben zum Ausdruck gelangen. An eine directe Wahruehmung von Wellenlänge und Schwingungsdauer, wie etwa bei den Wellen, welche die Oberfläche des bewegten Waſſers oder das geſpannte durch einen Schlag in Schwingung verſetzte Seil macht, iſt natürlich nicht von ferne zu denken, denn die Wellenlängen der Lichtwellen pflegt man in Milliontheilen eines Millimeters, die Schwingungsdauern in Billiontheilen einer Sekunde auszudrücken, in Größen

alſo, die ſehr, ſehr weit jenſeits der Grenzen unſerer Wahrnehmungs- und Vorſtellungsfähigkeit liegen.

Eine Hauptſchwierigkeit liegt in der außerordentlich großen Mannigfaltigkeit der Farbenempfindungen. Wie groß müßte an jedem Punkte der Netzhaut die Zahl der nervöſen Elemente ſein, wenn jede Farbenempfindung eines eigenen Elements zu ihrer Erregung, einer eigenen Faſer zur Weiterleitung bedürfte! Es war ein wichtiger Schritt vorwärts, als man erkannte, daß unſer Wahrnehmungsapparat derart organiſirt ſei, daß die ganze große Zahl der Farbenempfindungen auf eine ſehr einfache Weiſe entſtehe durch Combination weniger Grundempfindungen.

Ein ſcharfſinniger engliſcher Phyſiker, Thomas Young, ſprach im Anfang dieſes Jahrhunderts zuerſt die Vermuthung aus, daß es drei phyſiologiſche Grundfarben gebe, aus denen alle Farbenempfindungen ſich zuſammenſetzen. Roth, Grün, Violet waren die Grundfarben, welche Young aufſtellte, und er nahm an, daß jede empfindende Faſer des Sehnerven aus drei Theilen beſtehe, von denen jeder einer Grundfarbe diene. So vortrefflich dieſe Hypotheſe zu beſſerer Erklärung der Farbenperception ſich eignet, ſo hat das doch nicht hindern können, daß ſie für lange Zeit in Vergeſſenheit gerieth und erſt von Neuem entdeckt werden mußte. Es war namentlich unſer berühmter Phyſiolog Helmholtz, der die Young'ſche Theorie adoptirte, weiter ausbildete, und mit allen bis auf die neueſte Zeit aufgefundenen Thatſachen in vollſter Uebereinſtimmung fand. Nur in der Wahl der Grundfarben hat man in neueſter Zeit eine Aenderung treffen müſſen. Während Roth und Grün als Grundempfindungen ſich vollſtändig beſtätigt haben, hat man nach den Unterſuchungen des Engländers Maxwell Young's dritte Grundfarbe Violet mit Blau vertauſchen müſſen, obwohl hierin bis heute noch keine ganz ſichere Entſcheidung hat getroffen werden können.

Die Young-Helmholtz'sche Theorie lehrt über das Zustandekommen der Farbenempfindungen Folgendes. Jede Farbenempfindung entsteht durch gleichzeitige Reizung der den drei Grundfarben entsprechenden Nervenelemente, nur werden von verschiedenen Lichtarten die Elemente in ungleichem Grade gereizt und dadurch die Unterschiede der Empfindungen bewirkt. Nennen wir die, vorläufig noch hypothetischen, nervösen Endorgane nach den Farben, bei denen sie am stärksten mitwirken, die roth empfindenden, die grün empfindenden, die blau empfindenden Elemente, so wird einfaches rothes Licht zwar alle drei Arten von Elementen reizen, aber die roth empfindenden vorzugsweise; dadurch entsteht die Empfindung, die wir roth nennen. Ebenso wird grünes Licht die grün empfindenden Elemente, blaues Licht die blau empfindenden Elemente überwiegend reizen, freilich aber auch zugleich die anderen Elemente in geringerem Grade, und so die Empfindungen Grün resp. Blau erregen. Anders verhält sich die Erregung bei anderen Lichtarten. Das reine gelbe Licht des Spectrums z. B. reizt sowohl die roth empfindenden als die grün empfindenden Elemente ziemlich stark und etwa in gleichem Grade, während die blau empfindenden Elemente nur in ganz untergeordnetem Maße an der Erregung Theil nehmen. Orangenes Licht reizt die roth empfindenden Elemente stärker als die grün empfindenden, gelbgrünes Licht hingegen die letzteren stärker als die ersteren. Violettes Licht endlich reizt die blau und die roth empfindenden Elemente gleichmäßig, die grün empfindenden nur ganz unbedeutend. Durch die verschiedenste Vertheilung der Erregungsgrade kann nun, wie leicht ersichtlich ist, die ganze große Reihe von Farbenempfindungen hervorgerufen werden.

Mit Hülfe dieser Theorie begreifen wir, wie die nämliche Empfindung auf verschiedene Weise hervorgerufen werden kann. Die Empfindung Gelb z. B. wird nicht nur durch gelbes einfarbiges

Licht hervorgerufen, ſondern auch durch gleichzeitige Einwirkung rothen und grünen Lichtes. Rothes Licht reizt ſtark die roth empfindenden Elemente, ſchwach die übrigen, grünes Licht ſtark die grün empfindenden, ſchwach die andern: die roth und die grün empfindenden Elemente werden alſo in gleichem Grade erregt, ebenſo wie dies durch einfaches gelbes Licht geſchieht. Da aber bei der Combination von Roth und Grün die totale Erregung größer ausfällt, geſellt ſich zu der Empfindung Gelb eine Beimiſchung von Weiß.

Die gleichzeitige gleichmäßige Erregung aller dreier Grundelemente erzeugt die Empfindung Weiß und auch dieſe Erregung kann auf verſchiedene Weiſe zu Stande kommen. Einmal kann das Zuſammenwirken von rothem, grünem und blauem Lichte die Urſache ſein, doch auch jedes complementäre Farbenpaar kann die gleiche Wirkung haben. Rothes Licht reizt die roth empfindenden Elemente ſtark, die grün und die blau empfindenden Elemente ſchwach; das complementäre blau-grüne Licht reizt die roth empfindenden Elemente ganz ſchwach, dafür aber die grün empfindenden ſowohl als die blau empfindenden Elemente ſtärker, und wenn bei richtiger Intenſität und Menge des Blau-grün die Reizung für alle drei Elemente ſich genau das Gleichgewicht hält, ſo reſultirt die Empfindung Weiß. Aehnlich verhält es ſich mit jedem andern Paare von Ergänzungsfarben.

Aus dem Geſagten läßt ſich ferner leicht die Erklärung für eine bekannte Erſcheinung, das Auftreten complementär gefärbter Nachbilder, ableiten. Wenn man einen grell rothen Gegenſtand mit unverwandtem Blicke anſchaut und dann das Auge ſchnell auf eine weiße Fläche richtet, ſo erblickt man auf dieſer eine kurze Zeit lang ein complementär d. h. blau-grün gefärbtes Bild des vorher geſehenen Gegenſtandes. Dies iſt nicht ſchwer zu verſtehen. Die roth empfindenden Nervenelemente, welche durch die

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mum, während die Erregung der anderen Elemente noch ferner zunehmen kann, bis endlich bei äußerſter Helligkeit des Grün ein Zeitpunkt eintritt, wo nicht bloß die Erregung der grün empfindenden, ſondern auch die der roth und der blau empfindenden Elemente auf's Höchſte geſtiegen iſt. Dann muß blendendes Weiß geſehen werden.

Eine glänzende Beſtätigung für die Young'ſche Theorie von den drei phyſiologiſchen Grundfarben liefern die Erfahrungen, welche man über gewiſſe gar nicht ſeltene Fälle von mangelhafter Ausbildung des Farbenſinnes gemacht hat. Es iſt ein bekanntes Factum, daß das Farbenunterſcheidungsvermögen bei verſchiedenen Menſchen in ungleichem Grade entwickelt iſt, daß das Urtheil über Farben oft ſehr abweichend lautet. Will man dieſe Differenzen richtig verſtehen, ſo muß man mehrere Umſtände auseinander halten, welche hier von Bedeutung ſind. Einmal kommt, wie bei allen Urtheilen ſo auch beim Urtheil über Farben — und das Vergleichen iſt ja ein Urtheilen — der Grad des Urtheilsvermögens überhaupt in Betracht. Größere oder geringere Bildung, mehr oder weniger Beſchäftigung mit Farben und Uebung in der Beurtheilung derſelben, wird daher von großem Einfluß ſein. Allein hievon abgeſehen giebt es Unterſchiede in der Farbenperception ſelbſt, die in der Organiſation des Sehapparats begründet ſind.

Es geſchah bereits der Ermüdung Erwähnung, welche die längere Einwirkung grellen Lichtes auf die Netzhaut zur Folge hat. Nachbilder von complementärer Farbe ſind die Zeichen derſelben. Wenn dieſe gefärbten Nachbilder nun bei ſehr reizbarer Netzhaut früh und ſchon bei unbedeutender Erregung auftreten und, wie das oft vorkommt, ſehr lange anhalten, ſo können ſie nicht nur zu einer unangenehmen und läſtigen Plage werden, ſie trüben auch das Farbenurtheil; denn Farben, welche auf überreizten

und ermüdeten Netzhauttheilen ſich abbilden, erſcheinen weſentlich verändert durch die Vermiſchung der Eindrücke des gegenwärtigen und des früheren Netzhautbildes. Schon bei ganz normalem Sehorgan hat die Umgebung einer Farbe Einfluß auf das Ausſehen derſelben und der mit Farben arbeitende Künſtler hat alle Urſache die Wirkung des ſogenannten Contraſtes ſorgfältig in Rechnung zu ziehen.

Es giebt jedoch noch einen Umſtand, der eine ungleiche Farbenwahrnehmung bei verſchiedenen ſonſt ganz normal ſehenden Individuen bedingt. Derſelbe beruht auf einer Eigenthümlichkeit, welche das Auge des Menſchen vor dem aller Thiere auszeichnet. Die menſchliche Netzhaut nämlich beſitzt an der centralen Stelle, welche dem ſchärfſten Sehen dient, eine Ablagerung eines gelben Farbſtoffes. Da das Licht, bevor es zur Wahrnehmung gelangt, die gelb gefärbte Schicht paſſiren muß, ſo kann das nicht ohne Einfluß auf die Farbenwahrnehmung ſein, denn die Wirkung iſt keine andere, als würde durch ein dünnes gelbes Glas hindurchgeſehen. Nicht alle Farben werden gleich gut hindurchgelaſſen, der Nachtheil trifft hauptſächlich die blauen und violetten Strahlen. In der That lehren genaue Verſuche, daß andere Theile der Netzhaut, die ſeitlichen, etwas andere Farbenempfindungen liefern als der centrale gelbe Fleck. Bei verſchiedenen Individuen iſt nun die Menge und Intenſität des abgelagerten gelben Pigments ungleich, und es kann nicht fehlen, daß ſich nachweisbare Unterſchiede in der Farbenperception daraus ergeben, die keineswegs ganz unbedeutend ſind.

Neben dieſen Quellen geringerer Ungleichheit des Farbenſinnes giebt es nun noch viel tiefer greifende Anomalien. Wir bemerken, daß von manchen Leuten nicht bloß einander nahe liegende und verwandte Farbentöne, ſondern ganz verſchiedene Hauptfarben nicht unterſchieden, ſondern mit einander verwechſelt werden. Ganze

Gruppen von Farben fehlen ihnen vollständig, oder werden durch offenbar ganz abweichende Empfindungen ersetzt. Untersuchungen über solche Zustände, die man mit einem nicht sehr passenden Namen Farbenblindheit genannt hat, sind schwierig und müssen mit aller Vorsicht angestellt werden. Die Aeußerungen Farbenblinder sind nur mit Kritik zu benutzen, denn über die Beschaffenheit seiner Sinnesempfindungen kann man sich bekanntlich nur sehr schwer und höchstens durch Vergleich aussprechen. Dazu kommt, daß farbenblinde Leute die Ausdrücke für Farben, wie sie solche von Anderen gehört haben, benutzen, ohne daß sie dasselbe darunter verstehen, daß sie Namen im Munde führen von Dingen, die sie gar nicht kennen. Wenn Jemand z. B. behauptet, er sehe die Blätter einer Pflanze grün, so folgt daraus, daß er die Farbe, in der ihm die Blätter erscheinen, grün zu nennen sich gewöhnt hat, aber mit nichten, daß er dieselbe Farbenempfindung durch Beschauung der Blätter erhalte, wie der mit normalem Farbensinn Begabte. Er kann z. B. ganz wohl die Farbe sehen, die wir Roth nennen. Will man die Empfindungsfähigkeit Farbenblinder der Prüfung unterwerfen, so thut man besser sich dazu der einfachen Farben des Spectrums zu bedienen. Die Farben der Körper eignen sich viel weniger dazu, sie sind meist sehr zusammengesetzt, dabei wirkt die Art der Beleuchtung, die Lichtstärke, Glanz, vorgängige Kenntniß der Gegenstände so sehr mit, daß die Angaben höchst unsicher, die Resultate sehr wechselnd ausfallen. Die Verwechselungen der Farben sind oft so sonderbar und verwirrend, daß Goethe behauptete, bei einer Unterhaltung mit einem Farbenblinden über Farben müsse man fürchten, den Verstand zu verlieren.

Man hat nun in neuester Zeit viel Mühe und Sorgfalt auf die Erforschung dieser Zustände verwandt, und ist zu dem bemerkenswerthen Ergebniß gelangt, daß in den meisten Fällen ange-

borner Farbenblindheit eine der drei Grundempfindungen mangelt, und daß daher alle Farbenempfindungen ſolcher partiell Farbenblinden ſich aus zwei Cardinalfarben zuſammenſetzen. Wie anders muß ſolchen Leuten die Welt erſcheinen als uns! Nicht allein, daß gewiſſe Farben ihnen gänzlich abgehen, ſondern auch die vorhandenen müſſen ihnen zum großen Theil anders ausſehen, denn unſere Farbenempfindungen ſind ja das Reſultat der Erregung von dreierlei Nervenelementen, indeß bei Jenen nur zweierlei Elemente concurriren. Weiß z. B. kann dem Farbenblinden unmöglich ſo erſcheinen, wie uns; denn weißes Licht ruft bei ihm gleichmäßige Reizung beider ihm gebliebenen Grundelemente hervor, daher ſieht er die daraus hervorgehende Miſchfarbe, nennt dieſe jedoch unſerem Beiſpiele folgend weiß, unſer Weiß aber iſt ihm unbekannt. Wir können uns eine ungefähre Vorſtellung von den Farbenwahrnehmungen eines Farbenblinden machen, wenn wir ein farbiges Glas vor die Augen halten, welches gerade die Farben verſchluckt, welche dem Farbenblinden fehlen. Sehen wir anhaltend durch ein gefärbtes Glas hindurch, etwa durch eine blaue oder grüne Brille, ſo gehen uns manche Farben ganz verloren, andere erſcheinen verändert, aber wenn wir anhaltend hindurchſehen, gewöhnen wir uns, das, was uns blau reſp. grün erſcheint, ſchließlich für Weiß zu halten, überhaupt alle Farben anders zu beurtheilen. In einem ähnlichen Zuſtande befindet ſich der Farbenblinde permanent.

Verſchiedene Arten von Farbenblindheit giebt es nun, je nach dem der Defect dieſe oder jene Grundfarbe betrifft. Am häufigſten ſcheint Roth auszufallen. Der völlig Rothblinde ſieht nur Grün und Blau und deren Uebergangstöne in verſchiedenen Helligkeitsſtufen, aber von Farbenbenennungen gebraucht er ſehr viel mehr, weil er unter Menſchen lebt, von denen er ſie brauchen hört. Weiß muß ihm als Miſchung von Grün und Blau

erſcheinen. Was uns roth erſcheint, erſcheint dem mit Rothblindheit Behafteten theils ſchwarz, ſo namentlich das tiefſte reinſte Roth, welches die grün empfindenden und die blau empfindenden Nerven nur in ſehr geringem Grade erregt, theils als lichtſchwaches Grün, ſo namentlich das zum Orange neigende Roth, welches die grün empfindenden Elemente ziemlich ſtark erregt. Seine Farben nennt der Rothblinde jedenfalls anders, als wir ſie nennen würden, wenn wir ſie ſähen. Er ſpricht viel von Gelb, unterſcheidet auch oft richtig Grün und Gelb, jedoch nicht weil er die Empfindung beſitzt, die wir Gelb nennen, ſondern weil ſich beide Farben für ihn durch den Grad der Helligkeit, vielleicht auch einigermaßen durch ihren Ton unterſcheiden, was er genau kennen und beurtheilen gelernt hat. Als Beiſpiel der Verwechslung von Schwarz und Roth, die oft zu den ſonderbarſten Mißgriffen führt, wird der Fall eines Geiſtlichen erzählt, der ſich einen hochrothen Stoff, den er für ſchwarz anſah, zum Talar kaufte. Wichtig kann die Verwechſelung von Roth und Grün werden. Die Unfähigkeit, die bei der Eiſenbahn gebräuchlichen rothen und grünen Signale zu unterſcheiden, ſoll ſchon unheilvolle Folgen gehabt haben, und es iſt daher darauf aufmerkſam gemacht worden, daß als Beamte, welche mit farbigen Signalen umzugehen haben, nur ſolche Individuen verwandt werden dürfen, welche ein normales Farbenunterſcheidungsvermögen beſitzen.

Weniger häufig und erſt in jüngſter Zeit näher erforſcht iſt die Grünblindheit, der Verluſt der Empfindung des Grün und der damit verwandten Farben. Roth und Blau ſind die übrig bleibenden Grundfarben, die nebſt ihren Zwiſchenſtufen wahrgenommen werden. Die Empfindung des Violet freilich ſcheint aus nicht hinlänglich aufgeklärten Gründen im Ton nicht vom Blau unterſchieden zu werden. Bei dem Grünblinden kommt dieſelbe charakteriſtiſche Verwechſelung von Roth und Grün vor,

wie beim Rothblinden, allein ihm erſcheint das Rothe nicht grün, ſondern das Grüne roth, was ſich freilich durch bloßes Abfragen nicht ermitteln läßt. Ein grünblinder Knabe rief einmal aus: Wie ſchön roth ſind die Wieſen! Ein Verwandter dieſes Knaben kaufte rothes Tuch, um einen grünen Jägerrock daraus anfertigen zu laſſen. Sehr reines Grün erſcheint, da es die roth und die blau empfindenden Faſern nur wenig erregt, ſehr lichtſchwach, kann daher für Schwarz oder Dunkelgrau gehalten werden. Gelb erſcheint als helles Roth. Weiß muß in dieſem Falle als Miſchung von Roth und Blau erſcheinen, alſo als helles Violet oder Purpur, etwa in der Nüance die wir Lila oder Roſa nennen. Bei den unbeſtimmteren Körperfarben erfolgen übrigens gerade wie bei der Rothblindheit die allermannigfaltigſten, zuweilen ſcheinbar regelloſeſten Verkennungen und Verwechſelungen.

Sehr intereſſant iſt die Art wie, nach Preyer's Unterſuchungen, dem Grünblinden die Farben des Regenbogens oder des prismatiſchen Spectrums erſcheinen. Auf der rothen Seite ſieht er alles roth, auf der entgegengeſetzten alles blau, aber dieſe Farben gehen in der Mitte nicht durch Orange, gelb, grün, blaugrün in einander über, ſondern durch lichtſchwache Mitteltöne von Blau und Roth. Eine ganz ſchmale Stelle des Spectrums aber, gerade da wo ein normales Auge das reinſte Grün erblickt, wird als ein dunkles neutrales Grau bezeichnet. Die genaue Beſtimmung der Lage dieſes grauen Streifens hat dazu gedient, den möglichſt reinen Ton der entſprechenden phyſiologiſchen Grundfarbe feſtzuſtellen. Beim Rothblinden iſt es anders. Dieſer ſieht den Regenbogen ſowie das Sonnenſpectrum im Ganzen verſchmälert, da ihm von der rothen Seite ein Stück dunkel erſcheint; und einen ähnlichen Defect muß der Blaublinde an der entgegengeſetzten Seite haben. Merkwürdig iſt die Beobachtung, daß ähnlich wie dem Blinden eine feinere Ausbildung des Gehörs

und des Tastsinnes einigen Ersatz für seinen Verlust liefert, so bei der Blindheit für eine Grundfarbe zuweilen die Empfindlichkeit für die beiden anderen Grundfarben erhöht ist. Einige Grünblinde zeigten da noch Empfindung für schwaches rothes und blaues Licht, wo für das normale Auge bereits völlige Dunkelheit herrschte. Ein solcher Grünblinder muß den Regenbogen um ein Geringes breiter sehen, als der Normalsichtige.

Was den Mangel der dritten Grundfarbe anbetrifft, die Blaublindheit, so besitzen wir über diesen Zustand die spärlichsten und mangelhaftesten Beobachtungen, da er wohl am seltensten vorkommt. Goethe hat wohl schon in seiner Farbenlehre davon gesprochen und einen eigenen Namen — Akyanoblepsie — dafür erfunden, aber den heutigen Anforderungen genügen seine Angaben nicht mehr. Roth und Grün sind die den Blaublinden bleibenden Farben. Blau würde als eigene Empfindung fehlen, meistentheils mit Grün, gelegentlich auch mit Schwarz verwechselt werden. Interessant wäre es zu erfahren, ob bei jenem Zustande die Mitteltöne zwischen Roth und Grün, nämlich Orange, Goldgelb, Gelb normal gesehen werden, und vor Allem würden genau mit dem Spectrum untersuchte Fälle völliger Blaublindheit die noch schwebende Frage über die Beschaffenheit der dritten physiologischen Grundfarbe zur Entscheidung bringen.

Es soll, wenn auch freilich äußerst selten, vorkommen, daß von den drei Grundfarben zwei gänzlich fortfallen, also nur eine übrig bleibt. Wer an solcher wirklicher und vollständiger Farbenblindheit leidet, wird alles in einer einzigen Farbe sehen, sei es nun roth oder grün, oder blau, er wird nur Unterschiede der Helligkeit, nur Schattirungen wahrnehmen, ähnlich wie wir auf Kupferstichen und Photographieen; ein Zustand, um den wir wahrlich Niemanden beneiden möchten.

Bei den bis jetzt beschriebenen abnormen Zuständen des Far-

benſinnes, wo es ſich um den völligen Ausfall einer Grundfarbe oder zweier handelt, ſind die Erſcheinungen noch vergleichsweiſe einfach und conſtant. Schwieriger aber wird die Analyſe, wenn es ſich nicht um völligen ſondern nur theilweiſen Mangel einer Grundfarbe handelt, oder wenn die theilweiſe Aufhebung der Function ſich gar auf zwei Grundfarben erſtreckt. Solche Zuſtände ſind ziemlich häufig und die Erſcheinungen zuweilen ſo verwickelt, daß es ſehr ſchwer iſt, Regel und Geſetz darin zu erkennen. Ein Forſcher, der große Erfahrung über Farbenleiden beſitzt, E. Roſe, behauptete, er habe unter 60 Fällen von Farbenanomalien nicht zwei gefunden, wo die Erſcheinungen genau die gleichen geweſen wären. Allein nichtsdeſtoweniger wird man, wenn man rationell und methodiſch zu Werke geht, wenigſtens bei gebildeten Leuten, welche über ihre Empfindungen Rechenſchaft zu geben im Stande ſind, in den meiſten Fällen den Zuſammenhang enträthſeln und die Natur der Störung erkennen können.

Die meiſten Anomalien des Farbenſinnes pflegen angeboren und zeitlebens unveränderlich zu ſein und ſcheinen auf einem nicht näher bekannten Bildungsfehler zu beruhen. Oft vererbt ſich der Zuſtand und man beobachtet ganz gewöhnlich, daß mehrere Mitglieder einer Familie daran leiden. Uebrigens darf man nicht glauben, daß der Zuſtand theilweiſer Farbenblindheit ein ſehr ſeltener ſei, vielmehr haben ſtatiſtiſche Erhebungen ergeben, daß unter je 20 bis 30 Individuen eines die Anomalie zeigt. In England und namentlich in Rußland ſcheint das Vorkommen viel häufiger zu ſein als in Deutſchland, indeſſen auch bei uns iſt es keine Seltenheit. Freilich wiſſen die allerwenigſten Betroffenen davon; ſelbſt gebildete und gelehrte Leute kommen oft erſt ſpät durch Zufall, oder auch nie, zur Erkenntniß ihres Fehlers. Hat man ja ſelbſt wiederholte Beiſpiele von farbenblinden Malern gehabt. So ſeltſam das klingen mag, ſo ſteht die Thatſache doch durch

ſachverſtändige Unterſuchungen feſt und E. Roſe erzählt den ſelbſtbeobachteten Fall eines Malers, der Jahre lang in Farben nicht ohne Erfolg gemalt hatte, ehe er gelegenheitlich ſeines für einen Maler wahrlich fatalen Mangels inne wurde.

Es giebt auch Fälle, wo die Farbenblindheit erſt während des Lebens entſteht, ja es kommt vor, daß ein ſolcher Zuſtand nur vorübergehend und von kurzer Dauer iſt. Daß bei Erkrankungen des Auges, z. B. Ernährungsſtörungen der die percipirenden Elemente enthaltenden Netzhaut, Störungen des Farbenſinnes vorkommen, iſt nicht zu verwundern. Zuweilen liegt ein entſchiedener Zuſammenhang mit Erkrankungen der Leber, der Nieren, des Gehirns vor, und ſo kann die Unterſuchung des Farbenſinnes für den Arzt von Wichtigkeit ſein. Eine merkwürdige Erſcheinung iſt ferner die, daß man künſtlich eine gewiſſe Farbenblindheit hervorzurufen vermag, wenn man ein bekanntes Arzneimittel, das gegen die Würmerkrankheit im Gebrauch iſt, zu ſich nimmt. Dies Mittel, die aus den Wurmblüthen gewonnene Santonſäure, hat, neben anderen keineswegs angenehmen Nebenwirkungen, die Eigenſchaft für eine Reihe von Stunden gelbſichtig und violetblind zu machen. Alles Weiß und Grau hat einen Stich ins Gelbe, blau und violet werden nicht erkannt, erſcheinen wie ſchwarz. Dabei aber tritt, wenn man verhüllten Hauptes im Dunkeln die Wirkung des Mittels abwartet, ſpontan eine prachtvolle violette Färbung des Sehfeldes ein. Der Grund dieſes ſonderbaren Zuſtandes ſcheint ein anderer zu ſein, als bei den früher erwähnten Anomalien. Man hat nämlich gefunden, daß das Blut, welches in dünnen Schichten unter dem Mikroſkop geſehen, bekanntlich nicht dunkelroth, ſondern ganz ſchwach gelb ausſieht, nach Santoningenuß eine intenſivere gelbe Färbung annimmt. Wenn nun das in der Netzhaut enthaltene und bei jenem Zuſtande vielleicht in vermehrter Menge circulirende Blut von mehr gelber

Beſchaffenheit iſt, auch die Färbung des centralen gelben Flecks der Netzhaut intenſiver geworden iſt, ſo laſſen ſich die Erſcheinungen der Gelbſichtigkeit und Violetblindheit auf rein phyſikaliſche Weiſe erklären, dadurch nämlich, daß die gelbgefärbte Netzhautſchicht wie ein gelbes Glas die blauen und violetten Strahlen abſorbirt, und in allen gemiſchten Farben die gelben Strahlen vorwalten.

Viel weniger klar ſind wir über die Vorgänge bei plötzlich auftretender Farbenblindheit, wie ſie z. B. nach ſtarken Erſchütterungen und Verletzungen des Kopfes, doch auch ohne ſolche, vorkommen. Ich will nur einen Fall als Beiſpiel erwähnen, den der berühmte Phyſiker Tyndall berichtet. Ein Schiffskapitän, der früher ſtets ein gutes Farbenunterſcheidungsvermögen beſeſſen hatte, und ſich die langweiligeren Stunden ſeiner Seereiſen mit Ausführung bunter Stickereien zu verkürzen liebte, bemerkte einmal, als er dieſe amüſante Beſchäftigung bis tief in die Dämmerung hinein mit Anſtrengung fortgeſetzt hatte, daß ſeine Fähigkeit die Farben zu erkennen, erloſchen war. So blieb es fortan und der Mann konnte ſeitdem außer Blau keine reinen Farben, ſondern nur gelbliche und bräunliche Schattirungen wahrnehmen. Das Spectrum ſah er von normaler Breite, aber außer dem Blau ſah er alle übrigen Farben als gleichmäßiges weißliches Gelb. Offenbar war durch Ueberanſtrengung eine Veränderung in ſeinem Auge vorgegangen, welche ſowohl die roth empfindenden als die grün empfindenden Nervenelemente, nicht ganz, aber zum größten Theil, gelähmt hatte. Der Fall war beſonders intereſſant, weil er ein Individuum betraf, das zuvor einen guten Farbenſinn beſeſſen hatte und ſeine früheren Eindrücke mit den ſpäteren vergleichen konnte. Daher erkannte er auch, als Jener einmal durch ein rothes Glas das intenſive Licht einer elektriſchen Lampe aus großer Nähe betrachtete, zu ſeiner großen Freude die rothe Farbe plötzlich wieder, nachdem er ſie Jahre lang ſchmerzlich vermißt hatte.

Doch ich verlaſſe dieſe abnormen Zuſtände, um wieder zum Normalen zurückzukehren.

Wir haben geſehen, daß die Young-Helmholtz'ſche Theorie einen großen Fortſchritt in der Phyſiologie der Farbenwahrnehmung bildet. Allein ſelbſt, wenn wir ſie als erwieſen anſehen dürften, das Problem iſt dadurch nur vereinfacht, nicht gelöſt. Es fehlt noch der anatomiſche Nachweis der die Farben percipirenden Nervenelemente überhaupt, und der den drei Grundfarben entſprechenden Organe insbeſondere. Hierüber müſſen wir uns zunächſt ein wenig orientiren.

Das Organ der Lichtempfindung ſucht heute Niemand mehr, wie vor Zeiten, in der Kryſtalllinſe des Auges oder in der Aderhaut, dazu kann nur ein ächt nervöſes Organ beſtimmt ſein. Man weiß jetzt, daß der Sehnerv, welcher das Auge mit dem Gehirn verbindet, die Lichtempfindungen zum Centralorgane leitet, ſelbſt aber für Lichtreiz nicht empfindlich iſt. Dieſe Fähigkeit kommt allein ſeiner fächerförmigen Endausbreitung, der Netzhaut, zu, einer Membran von wunderbar zartem und complicirtem Bau, die uns, je tiefer wir in die Einzelnheiten ihrer Organiſation eindringen, deſto mehr Wunder offenbart. Trotz ihrer Dünnheit beſteht dieſe Nervenhaut noch aus einer Reihe deutlich verſchiedener Schichten. Zu innerſt, dem Glaskörper, gewiſſermaßen dem transparenten Kern des Auges zunächſt, breiten ſich durchſichtige Nervenfaſern aus, die von dem ins Innere des Auges eintretenden Sehnerven nach allen Richtungen ſtrahlenförmig auseinanderfahren. Von dieſen wiſſen wir bereits, daß ſie für Licht nicht empfindlich ſind, nur die Function der Leitung haben. Dann folgen mehrere regelmäßige Lagen verſchieden geſtalteter Elemente, die man zum Theil als Nervenzellen und als Körner bezeichnet, untermiſcht mit feinſten Fäſerchen, deren Function man noch ſo wenig kennt, daß nicht einmal triftige Vermuthungen

darüber existiren. Den Abschluß, die tiefste Lage, bildet eine sehr merkwürdige Schicht, die man mit Sicherheit als das eigentliche Organ der Lichtempfindung erkannt hat, und der wir deshalb noch etwas mehr Aufmerksamkeit widmen müssen. Nach dem mikroskopischen Hauptbestandtheil wird diese äußerste Lage der Netzhaut die Stäbchenschicht genannt. Die Stäbchen sind ungemein zarte, subtile Elemente, schlanke, dünne Cylinder, welche dicht gedrängt neben einander sämmtlich auf der Fläche der Netzhaut senkrecht stehen, den Baumstämmen des dichtesten Waldes oder einem Pfahlrost vergleichbar. Zwischen den Stäbchen schieben sich wieder andere Elemente ein, Zapfen genannt, die in ihrer Form nicht gar sehr von den Stäbchen abweichen, nur etwas mehr kegelförmig gestaltet sind, indem sie sich nach außen hin verjüngen.

Soweit war man schon seit einigen Decennien über den Bau der Netzhaut unterrichtet, allein man wußte wohl, daß hier noch manches Geheimniß aufzudecken sei. Mit Hülfe der sehr vervollkommneten Mikroskope haben in neuester Zeit viele Anatomen sich der Erforschung der feineren Structur dieser Theile gewidmet, und namentlich ist es einer unserer vorzüglichsten Mikroskopiker, Professor Max Schultze in Bonn, dem wir eine Reihe wichtiger Entdeckungen und großer Fortschritte auf diesem Gebiete verdanken. Ich muß mich natürlich nur auf einige Andeutungen beschränken. Man fand, daß die erwähnten Bestandtheile der Stäbchenschicht noch nicht die einfachsten Elemente seien. Jedes Stäbchen und jeder Zapfen besteht zunächst aus zwei Theilen, einem Innenglied und einem Außenglied, die sich wesentlich unterscheiden. Nur das erstere zeigt das Aussehen von Nervensubstanz, das Außenglied dagegen zeigt ganz andere optische Eigenschaften, und erweist sich bei sehr starker Vergrößerung untersucht, zusammengesetzt aus einer Anzahl über einander geschichte-

ter äußerſt zarter Plättchen, deren Dicke nicht mehr beträgt als ein halbes Tauſendſtel eines Millimeters. Dieſe Anordnung macht es nun ſehr wahrſcheinlich, daß die Außenglieder der Stäbchen und Zapfen eine ganz eigenthümliche Function haben. Man hat guten Grund anzunehmen, daß die vielfach geſchichteten Plättchen wie ein ſtark ſpiegelnder Apparat wirken, der die Action der Lichtwellen auf die empfindende Nervenſubſtanz, mag dieſe nun zwiſchen den Plättchen, oder in den Innengliedern liegen, bedeutend verſtärkt.

So wären wir denn dahin gelangt, im Geſichtsorgan eine analoge Vorrichtung zur Uebertragung der phyſikaliſchen Reizurſache auf die Nerven zu entdecken, wie im Gehörorgan. Die das Ohr treffenden Schallwellen verſetzen, ins Innere geleitet, gewiſſe abgeſtimmte Elemente (die Cortiſchen Faſern) in Schwingungen, welche in den Endfaſern der Gehörnerven Reizung bewirken, dadurch die Gehörsempfindung verurſachen. Die das Auge treffenden Lichtſtrahlen gelangen, in geeigneter Weiſe präparirt, auf einen reflectirenden Apparat, die Außenglieder der Stäbchenſchicht im Verein mit dem ſchwarzen Pigmentbelag der darunter liegenden Aderhaut, der ſeine Wirkung auf die letzten empfindungsfähigen Ausläufer der Sehnerven gewiſſermaßen concentrirt und die Lichtempfindung verurſacht. Eines freilich fehlt noch an der Analogie. Wir wiſſen, was bei der Reizung des Gehörnerven die Unterſchiede der Tonempfindungen, aber noch nicht, was bei Reizung des Sehnerven die Unterſchiede der Farbenempfindungen bewirkt.

Nur auf Umwegen iſt es gelungen, dieſer Frage etwas näher zu treten, ohne ſie jedoch ganz löſen zu können. Man hat die mikroſkopiſche Beſchaffenheit der Netzhaut bei verſchiedenen Thierklaſſen ſtudirt und durch die Vergleichung bedeutungsvolle Aufſchlüſſe über die Function der Stäbchen und Zapfen gewonnen. Das

Hauptreſultat iſt, daß die vorhin erwähnten Zapfen der Stäbchenſchicht höchſt wahrſcheinlich der Empfindung farbigen Lichtes dienen, indeſſen den Stäbchen nur die weniger beſtimmten, allgemeineren Lichtempfindungen obzuliegen ſcheinen.

Wir dürfen annehmen, daß es niedere Thiere giebt, denen das Farbenunterſcheidungsvermögen fehlt, deren Sehen ſich auf die allgemeinen Empfindungen von Hell und Dunkel und die damit ausführbaren Wahrnehmungen beſchränkt. Den ausgebildeten Farbenſinn müſſen wir für ein Vorrecht höher organiſirter Thiere halten. Im Thierreich ſtellt ſich nun für die Stäbchenſchicht eine ungleiche Verbreitung der Stäbchen und Zapfen heraus. Kein Thier entbehrt der Stäbchen, manche der Zapfen. Letztere ſtehen höher, denn niedere Thiergattungen ſind am wenigſten mit ihnen verſehen. Die als Stammeltern der Wirbelthiere betrachteten Knorpelfiſche, Haie, Rochen, Neunaugen haben nur Stäbchen, noch keine Zapfen. Entwickeltere Thierklaſſen haben neben Stäbchen auch Zapfen, und gerade bei ſolchen, deren Farbenſinn man für beſonders ausgebildet halten muß, findet man die meiſten Zapfen, z. B. bei den Vögeln. Beim Menſchen endlich finden wir großen Reichthum an Zapfen und gerade die Stelle, welche für die Diſtinction am wichtigſten iſt, das Centrum der Netzhaut enthält nur Zapfen, während nach den für Farben viel weniger empfindlichen peripheriſchen Theilen hin die Zapfen neben den Stäbchen immer ſpärlicher werden. Dahingegen findet man wiederum unter den höheren Thierklaſſen die Zapfen ſchwach oder gar nicht vertreten bei ſolchen Gattungen, die Nachts oder in der Dämmerung, wo Farbenunterſchiede ſich wenig geltend machen, ihr Weſen treiben, z. B. bei der Fledermaus, dem Maulwurf, unter den Vögeln bei der Eule. Dafür haben dieſe Nachtthiere ſehr ſtark entwickelte Stäbchen, die beſonders geſchickt ſchei-

nen, das spärliche einfallende Licht durch verstärkte Reflexion recht vollkommen zur Wirksamkeit zu bringen.

Nach alle dem scheint man berechtigt zu schließen, daß für die Unterscheidung der Farben die Stäbchen wenig, oder gar nicht geeignet, dagegen die Zapfen die eigentlichen Nervenendorgane des Farbensinnes seien. Als Hauptbeleg dafür habe ich indessen noch eine merkwürdige Thatsache zu erwähnen, die wieder einen tieferen Blick in den Farbenwahrnehmungsvorgang thun läßt. In den Zapfen der durch scharfes Sehen und guten Farbensinn ausgezeichneten Vögel findet man mikroskopisch kleine, zum Theil farbige Kügelchen oder Tröpfchen von solcher Lage, daß das Licht, welches zur Perception gelangen soll, sie nothwendig passiren muß. Die Kügelchen sind theils gelb oder orange, theils roth, theils farblos. Es ist klar, daß eine rothe Kugel nur oder doch überwiegend rothes Licht hindurchtreten lassen wird, ein gelbes Kügelchen gelbes Licht, nur durch die farblosen Kügelchen wird auch das brechbarste Licht, das blaue und violette, Eingang finden. Die farbigen Kugeln fehlen jedoch, was sehr interessant ist und auf die Bedeutung dieser Elemente hinweist, fast ganz bei solchen Vögeln, die auf nächtliches Leben angewiesen sind.

So zu sagen von selbst drängt sich hier die Beziehung zu der Theorie von den drei Grundfarben auf. Es scheint, als wenn bei den Vögeln die Einrichtung besteht, daß jede der Grundfarben ihre besonderen Endorgane hat. Ueber den Sachverhalt beim Menschen ist man zur Zeit noch nicht näher unterrichtet. Jedenfalls bestehen andere Verhältnisse, da die farbigen Kügelchen fehlen. Ob hier jedoch ebenfalls jede der drei Grundfarben ihre eigenen Elemente hat, oder ob etwa, was das bei Weitem Vollkommnere wäre, jeder Zapfen durch eine besondere Construction für alle drei Grundfarben, somit für alle Farbenempfindungen, zugänglich ist, steht noch dahin. Man hat in letzterem Sinne be-

reits eine Hypotheſe aufzuſtellen verſucht. Die verſtärkte Lichtreflexion in den aus parallelen Plättchen aufgebauten Außengliedern der Stäbchen und Zapfen und die Bildung ſtehender Lichtwellen durch das Begegnen der eintretenden und der zurückgeworfenen Strahlen könnte dazu dienen, die Einwirkung verſchieden farbiger Lichtſtrahlen auf beſtimmte Punkte jener Elemente zu localiſiren, ſo daß verſchiedene Farbenempfindungen in verſchiedenen Theilen eines und deſſelben Zapfens ſtattfänden. Auch hat man gewiſſe einfache Verhältniſſe zwiſchen der Dicke der Außenglieder-Plättchen und der Wellenlänge der Lichtſtrahlen verſchiedener Farben zu weiterer Ausführung einer ſolchen Theorie im Einklange mit der Young'ſchen Lehre zu verwerthen geſucht. Allein ich wage es nicht, den Leſer noch weiter auf das Gebiet der Hypotheſe zu führen. Haben wir doch gegründete Ausſicht, daß wenige Jahre fernerer Forſchung über dieſe Fragen zu ſichereren und abgeſchloſſeneren Reſultaten führen werden.

Ich darf nicht vergeſſen an dieſer Stelle zu erwähnen, daß es auch Farbenempfindungen giebt, welche ohne die gewöhnliche objective Grundlage, ohne den gewohnten Lichtreiz zu Stande kommen. Man nennt ſie ſubjective Farben und wohl Jeder hat ſie aus eigener Anſchauung in dieſer oder jener Form kennen gelernt. Schon die Nachbilder verſchiedenſter Art können dahin gerechnet werden, doch ſind dieſe, wenn nicht directe Wirkungen, doch wenigſtens Nachwirkungen äußeren Lichtreizes. Allein ſelbſt bei völliger Abweſenheit allen Lichtreizes, in völliger Dunkelheit und im Ruhezuſtande des Auges können durch Druck auf den Augapfel, durch Reiben, durch elektriſche Reizung, durch abnorme Blutbewegung im Auge oder im Gehirn, durch Abnormitäten der Blutmiſchung und ſonſtige krankhafte Vorgänge Farbenempfindungen hervorgerufen werden, die natürlich bloß ſubjective Exiſtenz haben, für Niemand anders als das empfindende Individuum. Solche ſub-

jective Farbenempfindungen ſind, wie auch ſubjective Gehörs-, Geruchs-, Geſchmacksempfindungen als Folgen centraler Erregung aufzufaſſen, die ausnahmsweiſe unter ungewöhnlichen Bedingungen auftreten, während ſie ſonſt nur die Folge peripheriſcher Erregung und centripetaler Leitung derſelben ſind.

Die weſentlichſte Aufgabe bei der Unterſuchung des Farbenſinnes kann vorläufig als erfüllt betrachtet werden, nachdem der Mechanismus des peripheriſchen Aufnahmeapparats für farbiges Licht, den man der Kürze halber, aber mit ſehr zweifelhafter Berechtigung, Perceptionsapparat nennt, erkannt worden iſt. Freilich fehlt noch viel, daß wir das Weſen und die Entſtehung der eigentlichen Farbenempfindung verſtünden, allein da mag als Entſchuldigung dienen, daß wir überhaupt noch von keinerlei Empfindung die Entſtehung kennen. Die Uebertragung des Lichtreizes auf die Nervenendigungen, die Erregung eines inneren Bewegungsproceſſes in den Nervenelementen, iſt noch lange nicht Farbenempfindung. Was der zum nervöſen Centralorgan geleitete Nervenproceß dort für weitere Folgen auslöſt, bis als Schluß des Ganzen die Empfindung ins Bewußtſein tritt, darüber wiſſen wir leider nichts. Die Anhänger der Schädellehre wollen freilich mehr davon wiſſen. Sie nehmen ein beſonderes Organ des Farbenſinnes an, das im vorderſten Theil des Gehirns ſeinen Sitz haben ſoll, und meinen ſogar die Entwickelung des Farbenſinnes an der Bildung der gerade über beiden Augen liegenden knöchernen Theile der Stirn ableſen zu können. Allein es iſt ja bekannt, auf wie ſchwachen Füßen dieſe ganze Lehre ruht, und das Organ des Farbenſinnes bildet wahrlich nicht ihre ſtärkſte Seite.

Wir haben ſchon im Vorbeigehen davon Notiz genommen, daß bei der Farbenwahrnehmung auch das Urtheil von Einfluß iſt. Hiefür giebt es manche ſehr bekannte Beiſpiele. So beurtheilen wir die Schattirung einer Farbe nach der Helligkeit der

im Ganzen herrſchenden Beleuchtung. Ein lichtſchwaches Weiß nennen wir im Allgemeinen grau, ein lichtſchwaches Orange braun. Wenn jedoch die Beleuchtung des ganzen Sehfeldes gleichmäßig ſchwach iſt, ſo halten wir ein Blatt weißes Papier, das neben anderen in lichtſchwachen Farbentönen geſehenen Gegenſtänden erblickt wird, keineswegs für grau, ſondern für weiß, einen orangefarbenen Gegenſtand nicht für braun, ſondern für orange. Umgekehrt halten wir ein graues Blatt, wenn es von heller Sonne beſchienen wird und viel heller beleuchtet iſt, viel mehr weißes Licht ausſendet, als jenes weiße Blatt in der Dämmerung, dennoch nicht für weiß, ſondern für grau, ſofern wir nicht etwa die Gelegenheit zum Vergleichen mit der Umgebung abſichtlich ausſchließen. Wir verſtehen eben unbewußt und unwillkürlich durch einen Act des Urtheils die allgemeine Beleuchtung in Rechnung zu ziehen.

Eine andere Aeußerung des Urtheils bemerken wir bei Erſcheinungen, die wir unter der Bezeichnung des Contraſtes zuſammenfaſſen. Einen weißen oder grauen Fleck auf einer größeren farbigen Fläche, oder eine neutrale ungefärbte Zone auf einer rotirenden farbigen Scheibe ſehen wir nicht in ihrer wahren Beſchaffenheit, ſondern mit einem Scheine der Complementärfarbe des umgebenden Grundes gefärbt. Auf rothem Grunde z. B. erſcheint der helle Fleck grünlich, namentlich wenn er durch einen dämpfenden Schleier hindurch betrachtet wird, auf blauem Grunde gelblich. Durch geeignete Vorſichtsmaßregeln kann man ſich überzeugen, daß in dieſen Fällen die Empfindung keineswegs direct geſtört iſt, ſondern lediglich durch einen Proceß des Urtheils. Betrachtet man nämlich die durch Contraſt gefärbt erſcheinende Stelle iſolirt, ſo daß der Einfluß der gefärbten Nachbarſchaft abgeſchnitten wird, etwa durch eine an beiden Enden offene Röhre, ſo hört die Contraſtfärbung ſofort auf und kehrt erſt wieder, wenn der

Vergleich mit der Nachbarfarbe wieder in Wirksamkeit tritt. Jeder kennt ferner aus eigenem Augenschein die bei farbiger Beleuchtung auftretenden complementärfarbigen Schatten. Bei rothgelber Abendbeleuchtung erscheinen die Schatten nicht schwarz oder grau, sondern durch Contrast deutlich dunkelblau, namentlich sehr schön auf weißer Schneefläche. Es ist also der Vergleich unmittelbar benachbarter Stellen verschiedener Farbe, der das Urtheil irre leitet. Der Grund ist darin zu suchen, daß das einen überwiegenden Theil des Sehfeldes einnehmende farbige Licht die Vorstellung vom Weiß alterirt. Es ist ein in der Farbe des Grundes ein wenig gefärbtes Weiß, das fälschlich für reines Weiß gehalten wird.] Dem gegenüber erscheint dann wirkliches, reines Weiß oder neutrales Grau in entgegengesetzter Richtung verändert, d. h. in complementärem Sinne gefärbt.

Der Einfluß des Urtheils auf die sinnliche Empfindung ist in hohem Grade bemerkenswerth und um so wichtiger, da man ihn auf verschiedenen Gebieten der Sinnesthätigkeit in analoger Weise wiederkehren sieht. Man wird sich darüber nicht wundern, wenn man bedenkt, daß ja jede Sinnesempfindung im Grunde genommen eine psychische Erscheinung ist, die bei dem dermaligen Stande unserer Kenntnisse noch scharf getrennt werden muß von den bis jetzt im Einzelnen bekannten Functionen der centralen Nervenapparate. Speciell von den Farbenempfindungen wissen wir bereits, daß sie die auf psychischem Gebiete in die Erscheinung tretenden Folgen einer auf die peripherischen Theile des Sehnerven einwirkenden Reizung durch Licht sind. Nichts kann daher verkehrter, nichts irrthümlicher sein, als den Farben eine objective Realität zuzuschreiben. Die Farben, wie wir sie wahrnehmen, existiren außer uns nicht, können nicht außer uns existiren, eben weil sie psychische Phänomene sind, Producte unserer eigenen körperlichen und geistigen Organisation. Allerdings dar-

über kann vernünftiger Weise kein Zweifel sein, daß objective Vorgänge und Zustände bestehen, welche in der Regel mit den Farbenempfindungen in ursächlichem Conner stehen. Allein, wie die Physik lehrt, sind diese objectiven Vorgänge nichts als schwingende Bewegungen von unendlich kleiner Excursion. Daß eine Art dieser schwingenden Bewegungen, wenn sie sich auf die Netzhaut überträgt, die Empfindung blau, eine andere Art die Empfindung roth, wieder eine andere Art die Empfindung weiß, endlich noch eine andere Art gar keine Farbenempfindung, wohl aber die Empfindung von Wärme in der Haut hervorruft, das beruht offenbar in der Beschaffenheit der empfindenden oder die Empfindung vorbereitenden Organe. Darum sind indessen die Strahlen selbst weder blau, noch roth, noch weiß, noch warm. Diese Empfindungsweisen sind vielmehr nur Reactionen unseres Bewußtseins auf die Einwirkung verschiedenartiger Reize. Es liegt also auf der Hand, daß die Farbenempfindungen mit den objectiven erregenden Ursachen, den Schwingungen kleinster Theilchen, nicht nur nicht identisch sind, auch nicht das eine das Vorbild, das andere das Nachbild, wie man sich das oft vorgestellt hat, sondern beide sind grundverschieden, nicht einmal vergleichbar. Der einzige Conner besteht in der Aufeinanderfolge und causalen Abhängigkeit. Die Farbenempfindungen sind uns daher lediglich *sinnliche Zeichen* für gewisse objective Zustände und Processe, von denen wir nur auf diesem Wege Kenntniß erhalten.

So sonderbar und schwer faßlich es zum ersten Mal, wenn wir diese Einsicht gewinnen, uns vorkommen mag, so ist es doch unbestreitbar: die glänzende Farbenpracht, welche Natur und Kunst vor unseren Augen ausbreitet, ist so, wie wir sie uns vorstellen, in Wirklichkeit nicht vorhanden. Sie ist Erzeugniß unserer eigenen Organisation, die Wechselwirkung unseres Organismus mit Vorgängen der Außenwelt.

Nicht anders verhält es ſich mit den Empfindungen, welche die anderen Sinne uns vermitteln. Sie alle ſind weit davon entfernt, mit objectiven Verhältniſſen und Unterſchieden der Dinge zuſammenzufallen, aber die Wechſelbeziehung zu dieſen iſt genügend eng und genügend conſtant, um uns daraus Schlüſſe auf die Beſchaffenheit der Außenwelt machen zu laſſen. Mancherlei Vorgänge und Beziehungen — wir haben davon einige Beiſpiele kennen gelernt — beſtehen in der Körperwelt, welche wir nicht direct ſinnlich wahrnehmen, höchſtens erſchließen, ahnen können, ſicher aber auch viele die wir nicht einmal ahnen können, die nicht bloß dem leiblichen Auge und Ohre, ſondern auch dem geiſtigen Auge der Wiſſenſchaft für immer verborgen bleiben werden.

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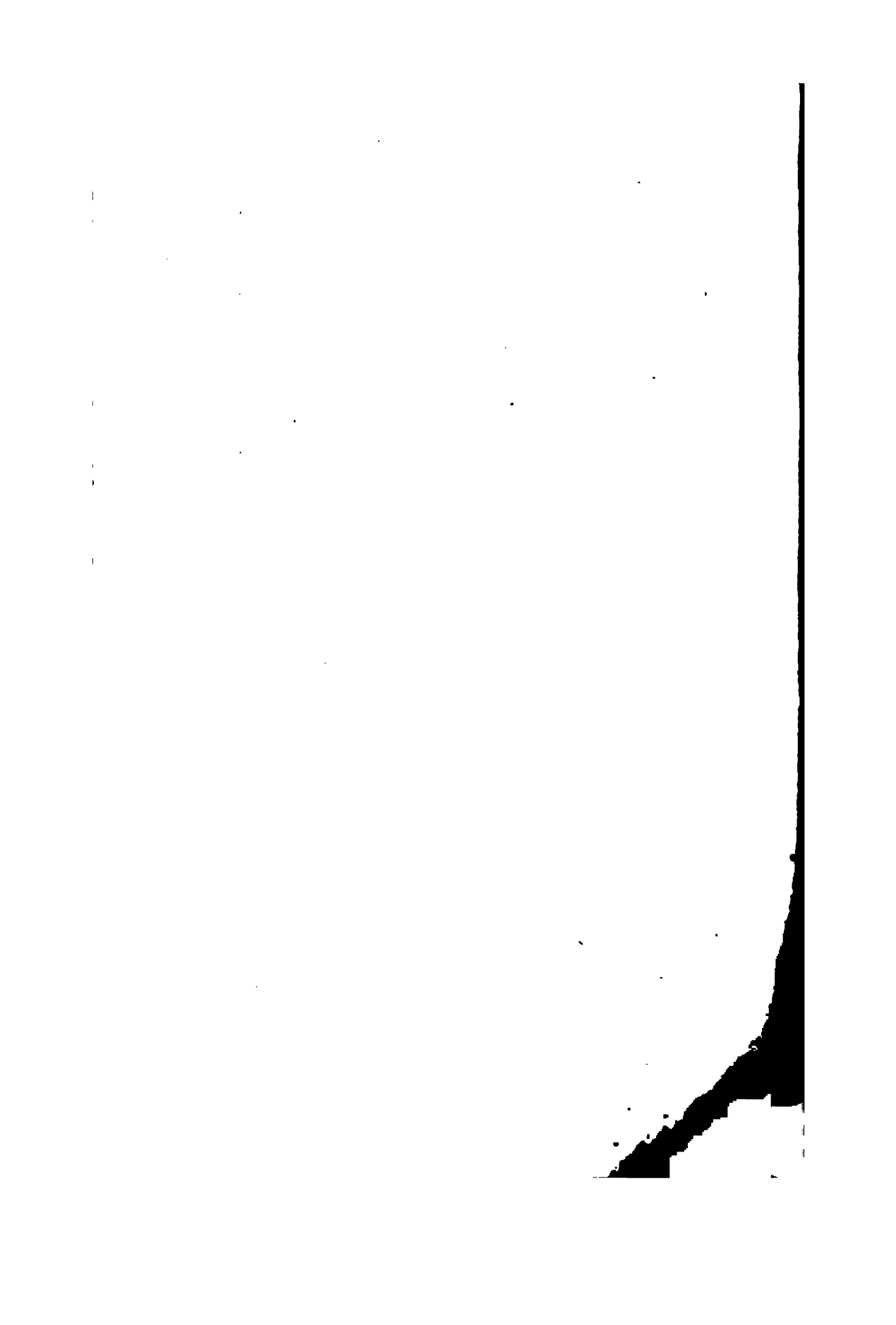

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THE DEVELOPMENT OF THE CHILD AS MODIFIED BY THE CONDITION OF HIS EYES.

BY

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Professor of Diseases of the Eye, Ear, Nose and Throat, College of Physicians and Surgeons, San Francisco.

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If I were to be asked to specify that portion of the human body which has received the greatest care during the past twenty-five or thirty years, I would unhesitatingly declare that it is the teeth. Generally speaking, care of the teeth is considered to be of the first importance, as it is thought that in this care lies the very foundation of health. We are told by the dentist,—and very properly I believe,—that unless this attention is given to the teeth from childhood to maturity, the seeds of future disorders in the digestive apparatus are very liable to develop, resulting possibly in very serious consequences.

The teeth are in truth the portal of the digestive tract and there is every reason why they should have the very best care, yet, if disastrous results are liable to follow their neglect, what shall be said concerning the consequences of habitual disregard of that more delicate and wonderful mechanism,—the eye,—neglect of which is especially noticeable in the case of children.

Through his eyes the child gains his first ideas of the external world; through them, aided by touch and muscular sense, he learns the direction, size and distance of objects in space. Very early in life his mind begins to take cognizance of visual impressions. Upon his ability to correctly interpret them may depend his whole future life, either for success or failure. If, through any defect in his eyes, false or distorted pictures of objects are formed upon the retina, then will his notions of the external world be erroneous, his judgment unreliable, and but little dependence can be placed upon his state-

ments concerning events coming under his personal observation.

Like unto the humming bird, as with swift motions it darts from flower to flower in its search for the nectar concealed within its petals, so the restless eyes of the child, impelled by curiosity, are ever turned from object to object. Unconsciously his mind is now receiving its first knowledge of the external world.

There should be no cause for surprise, if the child, provided as he is, with a most marvelous organization, made to collect, transmit, assort and store up in the cells of the brain the products of the visual impression for future reference, should misinterpret their meaning, if the picture of object looked upon be imperfect. That the mind may be able to correct wrong visual impressions it must possess a true standard; such cannot in the nature of things pre-exist; it comes, and must always come, through experience alone.

Before the fifth year,* a child's perceptive powers have begun to unfold. He is gradually learning the power of attention. Slowly but surely his mind is being filled with a desire to know. His former uncontrolled inquisitiveness is gradually giving place to acquisitiveness. He asks for the meaning of things. His mental horizon expands, he originates ideas, he is beginning to think.

During this period of receptivity the eyes should be capable of seeing the most accurately. At this period of life, should there be errors of refraction, they are most easily and satisfactorily corrected.

The study of anatomy and physiology teach us not only that the child may suffer physically and mentally, but that his whole character may be greatly modified, or even changed, by the condition of his eyes.

This brings us to the thought that the educator should have an equal if not greater interest in this subject than has the ophthalmologist, for the latter usually looks upon the eye as an optical apparatus subject to errors of refraction and to disease.

The educator on the other hand usually considers the child's eyes, if he thinks of them at all, solely as an optical instrument through which he receives his knowledge of the external world. He generally disregards their possible inaccuracy in receiving vis-

*G. Stanley Hall thinks a child gets half his perceptive material for life before he is three years old.

ual impressions. Of all persons the educator should clearly understand that the child's eyes should be optically accurate at the very commencement of his educational career.

The intellectual development of children has of late been receiving much attention, especially from the psychological standpoint. To none has this study of the psychology of childhood been productive of more value, to none has it been of more absorbing interest, than to the educator. To him we must continue to look for the best results following intelligent and scientific methods of observation and grouping of observed phenomena. Here is where the teacher and the psychologist should meet on common ground, and where they can be of mutual benefit. Who can better draw out the child's superstitions, his little interests, his games, his ideas, his concepts of the external world, and his ambitions, than can the intelligent and enthusiastic educator.

He may study them as individual units, or as groups of units, yet all the while he has ever before him a kaleidoscope in the daily changes taking place before his eyes. No two successive school days are alike. One day all is quiet and the machinery of school life works without friction or perceptible jar; the next day, from some inexplicable cause, there is a radical change, confusion and disaster prevail. To discover the causes and the remedy for these lightning-like changes must of necessity be the work of the observing and thoughtful educator. We want to know the best methods for awakening in the child an intelligent interest in the world about him. For a solution of these problems we must likewise turn to the modern educator, he who is studying children, as Bacon taught us to study the phenomena of nature, by the inductive method.

For several years I have taken great personal interest in the subject of the influence of refractive errors upon the child's development. It has, however, been somewhat superficial, and of necessity my view has been from the standpoint of the physician. I have latterly read with great interest, as well as with great profit, I hope, a number of excellent papers by Prof. Earl Barnes and his co-workers, which have appeared in "Studies in Education." These deal with some of the most interesting studies of the mental processes by which a child obtains his earliest impressions of life, which it has been my good fortune to meet. The possibilities for future usefulness which may

grow out of this new method for getting at the child's inner consciousness are so great that it is not difficult to believe that from this ferment a truly scientific and rational method of education may be the final result.

In our enthusiasm for the new methods we must not, however, lose sight of this fact, viz.: that there was never a time when it was more important that the child's physical development should be equal to the mental work required.

A one-horse power machine can never accomplish the full measure of its capacity for work for any great length of time, there must always be an abundance of reserve energy. It should never be called upon to exert its full force, else it will soon go to pieces. In like manner we should not only know that the child has the capacity for doing his work for a limited time, but a reserve force, so that what he does shall be done without waste of nerve energy. It is right here, if I may be pardoned for saying so, that the educator in his enthusiasm for his work, is liable to come in conflict with certain laws of nature which ordain that the body must be capable of far greater work than it is liable to be called upon to do.

During the past ten years, perhaps longer, there has been collected a fairly large amount of data bearing upon the study of child-life. Much of this material has been furnished by the child himself, he has written down his autobiography, he has told his little experiences in simple words or with his pencil, and we have found a rich mine which has scarcely been prospected as yet. Enough, however, has been unearthed to show us that by patient perseverance in separating the gold from the dross there is more than sufficient of value to amply repay us for the labor so spent.

It is well worth noting that the child when he attempts to put his ideas into words or picture, never goes outside of his own individual experiences; he has at least a mental picture, more or less vague, of some object which he has already seen with his own eyes. A great many of these records are curious, some are even startling for the suggestiveness which they present of the child's mental operations. We are not unfrequently given hints of his latent possibilities, and occasionally we see the most unexpected pictures develop, which reveal his concept of the external world.

Some of the recorded phenomena are incongruous, without

even an intelligent suggestion. In some we find the most remarkable lack of the power of attention and inability to comprehend the most simple story.

Is it not possible that many of the unusual and peculiar phenomena noticed in some of the cases related by observers may be due to some anomaly of vision, thereby causing odd and most unexpected or even fanciful replies to be given to many of the questions asked? Such I believe to be the case, and I also believe that previous to studying child-life from the psychological standpoint, his capacity to apprehend what is expected of him should be first determined by an examination of his physical powers. This may seem to be a trite observation, nevertheless it is a truth which the great majority of teachers and even physicians, for that matter, fail to fully comprehend. It is a noticeable fact, and it serves to emphasize this point, viz.: that children, as a rule, try to put into concrete form their notions of things; they will even attempt to make visible to the eye that which should be left to the imagination. For example: the story of the fox, the crow and the cheese, having been told to a class of children, they were asked to give their ideas of it by making a picture illustrating the story. One of the children in drawing his picture of the fox, drew a line from the mouth down through the neck into the body. The teacher, puzzled to know what the child meant by this line, asked him for its meaning, to which he replied: "That is the cheese going down the throat of the fox." The invisible was here attempted to be made visible by reason of his own experience with the phenomenon of swallowing food.

Let the child, or even the adult, be asked to draw a picture of a star, and he will invariably add radiating lines to show that it is intended to represent a star, and why? Because from his point of view stars have rays. We know that stars are simply points of light situated at immeasurable distances from us in space, and that the appearance of rays is merely subjective, being due to the structure of the lens of the eye. In proof of this, look at the stars on a clear night through a pin-hole made in a card, you will then see them as they are, points of light. The diaphragm thus made in the card cuts off all the rays, excepting those passing through the centre of the lens, thus eliminating the circles of diffusion present, to some extent, in every eye.

If wrong concepts of form or wrong inferences can thus be drawn from so slight an irregularity normally present in the lens of the most perfect eye, so much the more easy will it be for us to understand that children whose eyes have other and more serious impediments to the formation of true images upon the retina, will make mistaken deductions respecting every object coming within their line of vision.

It would appear that no conclusion is more justifiable than this, viz.: that accuracy of observation and distinctness of vision are inseparable, and the first in importance.

Closely allied to the foregoing it is instructive to note the changes which may take place in the shape of the eyeball as the growth of the body progresses.

It is a well-known fact that between the ages of 5 and 18 physical growth is very rapid, so rapid is it in many instances that the nervous system shows marked disturbances, all the vital forces seeming to be more than fully employed in aiding this growth. Coincident with this physiological development we find that an extra call is now made upon the child's vitality by our system of education.

There are those, I am well aware, who may be inclined to doubt these statements. They feel that too much is being made of this notion of children being mentally overworked, or that the eyes are the cause, to any considerable extent, of failure to continue school work.

A prominent educator of this State, in my presence not long since, caused no little astonishment by remarking that there was a great deal of nonsense with this whole business of children's eyes. "The work," he said, "is not too much either in quantity or quality, just enough to keep them busy and out of mischief." He believed that it was other and more potent causes which prevented so many children from attending school between 12 and 16 years of age.

This statement was made by a teacher of thirty years' experience and exhibits a most remarkable lack of development of his faculty of observation, for from his own school there has been an unusually large number of pupils, especially girls, who have gone almost to pieces from the strain imposed upon their nervous system by the course of study there pursued. In every case which I have seen, errors of vision, marked enough to account for this loss of physical energy, neuralgia, headache,

lassitude, poor digestion, poor appetite and a tendency towards querulousness of disposition have been found.

One mother said to me: "Doctor, I do not know what to do with my daughter, she is not like her real self any more, everything seems to go wrong with her, she is peevish, easily fretted, especially by the younger children, and has lost all ambition." Examination of her eyes revealed troublesome astigmatism which had been a serious handicap for her in her work for years. After correction there was complete restoration of health, and she resumed her usual work in a few weeks with a joyousness which was in remarkable contrast to her former condition.

This not an uncommon case; but typical of a large number who break down at a critical period of their lives. When such cases are so frequent we feel sure that somewhere and somehow great injustice is being done to children. Yet what else are we to expect when those who have the destinies of the next generation in their keeping make statements like those which I have quoted above. It is this manifest indifference on the part of those who should be the most interested and most alert that so discourages the earnest student in new fields.

Within the past thirty years, there has been brought together by diligent students in Europe and in this country a vast collection of statistics bearing on the subject of school-children's eyes. The main purpose has been to discover whether the physical and mental disturbances which are known to be very prevalent among school children are due to our modern system of education or to some other cause.

The paramount necessity for first undertaking these examinations was due to the discovery that myopia or short-sightedness was rapidly increasing among the German school children and students.

Among the first facts brought out by an examination of the first statistics made were that eye-troubles dependent upon errors of refraction commenced to develop with the very first years of school life.

Taking myopia as an example we find that it is not only rapidly increasing in Germany and France, but all over the civilized world. More study has been given to this variation from the normal type of eye than to any other, or perhaps to all other errors of refraction.

Some of the results growing out of this study may be summed up as follows: All physiologists and ophthalmologists agree that since the time when examinations of the eyes to determine what the actual facts are were entered upon, it has been demonstrated, first, that this increase of myopia has been very marked during the past 20 or 25 years; second, that the first appearance of myopia is coincident with the child's first year in school; third, that with each year's progress in school work, myopia exhibits a proportionate rate of increase; fourth, that it is primarily due to excessive and prolonged use of the eyes at the near point; fifth, that it is not congenital, only in so far as all inherited tendencies may be called congenital.

Moreover, on account of the tendency of the myopic eye to increase in length as myopia increases, changes take place in the inner tunics of the eye,—the choroid and retina,—by which not only are the percipient elements,—the rods and cones,—displaced and separated from each other, but pathological changes are always imminent.

From the 200,000 or more examinations of children's eyes which have been made up to the present time the following propositions may be formulated, namely: First, myopia is an over development of the eye, usually beginning with the child's first use of his eyes at the near point. Second, it is found in increasing percentage rising steadily with the advancement of school work, and found the least where the least work at the near point is required. Third, according to the degree of myopia the mental development of the child will be more or less retarded.

As year by year the demands upon the eyes in school work have been growing greater and greater, the conclusion is inevitable that to our modern system of education we must turn for the real source of any of these defects.

It has been found that the strain upon the ocular muscles, (by which the eyes are drawn towards each other and sustained in that position as long as the two eyes are looking at a point within 12 or 14 inches of the eyes), together with an error of refraction, make a combination such that the child's power of co-ordination becomes exhausted, resulting in too many cases in a variety of abnormal nervous phenomena.

To the unthinking these phenomena are assigned to almost any cause but the eyes, yet, examination of those children who

break down during school work,—who collapse as it were, at the close of some examination,—will demonstrate that they are victims of nature's effort to produce results with eyes not suitably adjusted to the work which they are attempting to perform.

From 12 to 14 years in the case of girls is a very critical age, and it is then they so frequently exhibit the first symptoms of eye-strain, though the immediate effects are not directly traced to the eyes or even felt in the eyes. A further examination of these statistics shows that in the older centers of civilization are to be found the highest type of myopic development. If we take for example Germany, as perhaps the oldest community where a system of education from childhood to the most advanced university work, has been the most carefully and scientifically developed, myopia ranges from about 1 per cent in the lowest grades up to 70 or 80 per cent in some of the higher, or in special institutions of learning.

Furthermore, as we leave these old centers of education and turn to the newer, the percentage of myopia is found to be very much less. In California, for example—a comparatively new center of civilization—myopia exists in but a small percentage of the school population. Of 311 Freshmen of the University of California whom I examined, I found but a little over 7 per cent with uncomplicated myopia; this is scarcely higher than is found in some of the lower schools of Germany. Later examinations show that this percentage is now too low, it is gradually rising.

Children are not born myopic, but the tendency to it is inherited in a vast proportion of the cases. Children of myopic parents become myopic much more quickly than do children born of parents having normal or approximately normal eyes. That which is overwork for one child may be only play for the second. Strong hereditary tendency to myopia is frequently exhibited by a characteristic appearance of the face and eyes. Their expression is frequently stupid or even sleepy. They are likewise shy and prone to spend their time over books or other sedentary occupations. The typical myope is inclined to walk with his head thrust forward as though trying to peer into space. All objects situated beyond a comparatively short distance are more or less blurred, hence he is very apt to nip his lids together to cut off to some extent the circles of diffusion. This habit of blinking becomes very noticeable in many persons. The

myope's eyes are often exceedingly prominent, actually projecting in front of the socket. The white of the eye is very noticeable. This condition is due to the elongation of the eye-ball which gradually lengthens from the antero-posterior diameter. The myope's eyes are farther apart than normal measuring from the centers of the pupils. This tends to restrict their movements in the orbit. Not only the eyes, but even the cranium may become modified; its tendency is to become elongated. The face sometimes looks narrow. The myope also is inclined to hold his book close to his eyes, he bends over it instead of sitting upright, and moves his head from side to side as he reads. This tends to cause divergence of the eyes, the suppression of one image and loss of binocular vision. Children have been not infrequently punished by parents and teachers under the supposition that this was simply a habit of which they could be broken. In progressive cases myopia may lead ultimately to blindness.

They have such subjective sensations as seeing sparks or flashing before their eyes. Seeing moving specks is a common experience among myopes. Vertical and horizontal lines do not always appear as straight lines, but more or less crooked.

Myopia may unconsciously increase to a considerable degree before the fact is recognized. This is very well illustrated in the following case, it also serves to show the very general lack of power of observation on the part of parents.

A young lad of 10 years of age was brought to me by his father with the statement that something must be the matter with the boy's eyes, for the teacher had sent him home with a note suggesting that an examination of the eyes be made, as he was very backward in his studies, and did not appear to comprehend as much as the average child of 6 or 7 years of age. It is significant that in reply to the question I put to the father, "Have you or your wife never noticed anything peculiar about the child's eyes?" he said: "Nothing special, only the habit he has of bending up almost double in his chair when he reads, and we are always scolding him to make him sit up straight like other boys." As a matter of fact the boy was absolutely unable to distinguish a person over 50 feet away, and then not clearly. Putting on proper glasses gave the child normal vision. As he walked out of the optician's store on to the street the first thing that struck him was his ability to read names on sign boards

across the street. This so amazed him that he asked his father if he could read them.

This child as he walked up the street amused himself reading letters as far off as possible. All the way home tears ran down his cheek, his father afterwards said that the boy cried for joy. He never before had such a view of the world. He for the first time saw the long line of lamps on the street and the stars in the heavens. From that day his whole nature seemed to change, he became one of the brightest boys in his class, and equally as fond of games as his companions. The noticeable feature of this case was the obliviousness of the parents to the boy's condition.

Landolt says that "myopia is a type of forced evolution to meet the demands by civilization." This is undoubtedly true and it is nevertheless true that our aim should be to lessen these demands and relieve the eyes from the necessity of being forced.

In our far western country we find less of this hereditary tendency to myopia than is seen in the East and in Europe. Our children commence life as a rule with better eye-sight than do the children of older civilizations. The great majority of fathers and mothers of California children, are people who came to this country to carve out for theselves fortunes and homes by the strength of their muscles and the sharpness of their wits. Not being forced to over-tax their eyes in their younger days their immediate descendants have been able to commence life with less tendency to development of myopia. In some of the older centers of civilization the children are the descendants of myopes, through several generations of myopes.

The myope's experience of the external world being bounded by his limited horizon, he becomes introspective, he lives to a considerable extent within himself, and there is always present a possible danger to the eyes. We therefore conclude that the higher our civilization, as we measure civilization to-day, the higher will be the percentage of myopia.

If myopia were the only error of refraction giving us concern, it would be a sufficient reason for the interest we ought to take in this subject; but there are other physical departures from the normal, such as hyperopia and astigmatism, which are capable of exerting as great or even greater influence upon the development of the child than myopia. Since all children born into the world are hyperopic, and a large proportion astigmatic as

well, we have an added reason for believing that undue strain put upon the eyes during their developmental stage, characteristic symptoms will become marked, indicative of serious disturbances of the nervous system. Such children are obliged to exert a greater or less power of their accommodation from the time they open their eyes in the morning until they close them in sleep at night. This constant strain upon the muscle of accommodation and convergence is frequently the immediate cause of such disturbances of the nervous system as headaches, asthenopia, fatigue of the eyes, sleeplessness, twitching of the facial muscles. Reflex neuroses, such as stammering, blind spells, paralysis, loss of memory, chorea, gastric disorders, dizziness and vertigo; and such physical phenomena as hallucinations, night terrors, seeing of bright lights and flashes are examples.

The typical hyperope presents fully as marked physical characteristics, and even far greater pronounced subjective symptoms of his condition than the myope. As we have seen the eyes of the myope are overdeveloped, those of the hypermetrope, on the contrary, are undeveloped, there is in fact an arrest of development. The eyes of the hyperope resemble the eyes of the lower races and animals which are nearly always hyperopic.

The face of the typical hyperope is very characteristic. It presents a flat appearance which is due to the shallowness of the bones of the orbit, it may also be asymmetrical, one side being visibly smaller than the other. The nose is smaller than the normal, and the bridge may be so flat that it is with great difficulty that spectacle frames can be adjusted. The eye-balls are also smaller than the normal and flattened in the antero-posterio diameter. Convergent strabismus is a common accompaniment.

Usually there is a difference between the two eyes which in some cases may be very great. For example, one eye may be normal or even myopic, the other hyperopic or astigmatic. There may be present asymmetry of the cranium, this would indicate that one half of the brain was better developed than the other.

Hyperopic children are given to scowling and wrinkling their forehead. The retinal images in a hyperopic eye being indistinct the eyes are held as close as possible to the book, this gives an enlarged though not very distinct image. As they often hold their book close to their eyes they are thought to be myopic.

Unlike the myope who obtains a perfectly clear image of *near* objects, the hyperope has upon his retina indistinct images due to circles of diffusion. In holding his eyes close to his work he does so to get an enlarged image. On the other hand the young hyperope will as a rule see *distant* objects distinctly. His focus being behind the retina it can be shortened by action of the muscles of accommodation. This causes the lens to become thicker in the center.

No amount of innervation from the visual center can cause parallel rays to be carried backward to a focus upon the retina of the myopic eye, hence no force is expended in making the attempt. On the other hand, innervation can and does act continuously upon hyperopic eyes to bring the focus of parallel rays forward. Hyperopic children therefore are obliged to exert a greater or less power of their accommodation from the time they open their eyes in the morning until they close them in sleep at night. This constant strain upon the muscle of accommodation and convergence is frequently the immediate cause of such disturbances of the nervous system as headaches, asthenopia (fatigue of the eyes), sleeplessness and twitching of the facial muscles. Reflex neuroses, such as stammering, blind spells, paralysis, loss of memory, chorea, gastric disorders, dizziness and vertigo; and such psychical phenomena as hallucinations, night terrors, seeing bright lights and flashes, are examples. Under such circumstances spasm of the muscle of accommodation may be so great that myopia is simulated. This is caused by over-correction by which the focus is brought in front of the retina.

Those cases which have unequal curvatures of the cornea, the astigmatics, are very numerous and subject to very troublesome nervous affections. Unless this lack of symmetry of the cornea be due to injuries, ulcers, burns, or to operations, it is congenital. It may be, usually is, in fact, combined with hyperopia or myopia.

More scientific and accurate means for measuring the corneal curvature has served to disclose the fact that eyes with astigmatism are more common than eyes without. It is a very frequent cause for certain forms of headache of a neuralgic type. The attempt of the muscle of accommodation or focus muscles to overcome this defect by acting with unequal tension upon the lens, may be the direct cause for some of these peculiar reflex

symptoms. That astigmatism has been overcome tempo rarily by some such force we have innumerable facts to substantiate. Innervation of the visual center will often correct these errors, especially in the young if the error is not too great, but the visual acuteness thus induced is done at the expense of tremendous strain upon his nervous system, and his surplus energy consumed with frightful rapidity. Is it any wonder then that those who are impressed with this subject, ask the question, "Is an education obtained at such cost to health and comfort really worth the outlay?" When it is considered that at least 90 per cent of all this terrible loss of vital nerve energy is absolutely needless, the great wrong to the individual and to society by reason of this neglect will be appreciated.

Do you imagine that the thin, pale, anæmic, listless boy or girl who comes home from school every afternoon complaining of tired feelings, headache, fretfulness, and a host of other disturbances so familiar to you all, is the better for his hours spent in schools?

He is probably suffering from some refractive error which should be corrected with glasses at the earliest possible moment, else the time spent over his studies will be worse than wasted. Until this is done he cannot hope to be on a par with his more vigorous schoolmates.

The child whom you met on the street to-day with eyes which seemed to be looking into each other, has strabismus, probably due to an error of refraction which has prevented his visual centers from combining the two images into one. Many of these cases are susceptible of cure if taken in proper season, without the necessity of an operation. It is not an uncommon thing for parents of these cross-eyed children objecting for one reason or another to having an operation done. They have not learned that one eye is doing the work, and that it is simply a matter of time when one eye will be of little use, otherwise they would very quickly accept any remedy which promised a cure.

Those parents who insist upon having their children's teeth cared for by the dentist, and who are careful to carry out every instruction given them, will, on the other hand, obstinately refrain from having the eyes examined for fear that glasses will be put upon their child which they will always thereafter have to wear. They fail to realize that an examination of the eyes means something more than simply sitting before a chart and naming letters twenty feet away.

Most hyperopic children, unless the hyperopia be very great, have normal vision. This is a most important fact to bear in mind, for herein lies the stumbling block which prevents the ordinary observer from recognizing the relationship which may exist between the many peculiar nervous phenomena witnessed in children and the state of their eyes.

This matter of visual acuteness is too important to be passed over lightly for several reasons, the principal one is that a test of his eyes by asking a child to read certain letters at a distance of twenty feet, the method commonly employed by examiners of children's eyes, is unreliable. As a matter of fact the so-called chart test possesses but limited practical and less scientific value as a test for refractive error. By it we simply learn the one fact that some children have better vision than others, or to put it another way, we are able to pick out those children who have vision less than normal. We are also able approximately, to detect those who are near-sighted.

The chart test can never reveal the number who are hyperopic or astigmatic, for at least 70 per cent of these cases have normal vision.* We are therefore safe in saying that the chart test gives totally unreliable results.

The teacher who expects to discover among her pupils those who need glasses by testing their visual acuteness will be disappointed. Those most needing glasses may be just the ones who can read the smallest test letters. We can say, then, that this ability to read the test letters at twenty feet is not at all incompatible with a high degree of refractive error. It also disproves the prevalent idea that the necessity for glasses ought to be indicated by loss of visual acuteness. An examination of children's eyes by the objective methods is the the only reliable scientific test. Paralyzing the accommodation, the use of the ophthalmoscope, Javal's ophthalmenter and skiascopy or the Shaddow test should be employed in *all* cases.

The child's environment must be taken into account; his life at home, character of his food, exercise, etc., are features not to be neglected. But all this means special training, which should not be expected of public school teachers.

In the light of the enormous mass of statistics which has been laboriously collected on this subject, we freely confess

* Analysis of 1,800 cases of errors of refraction in "The Modern Eye" by the author of this paper.

that if they are to serve no higher purpose than to afford interesting studies for the scientist, then, indeed, has this work been in vain.

We hope, however, for better things; we believe that the signs of the times point to a growth of public sentiment which must, in the near future, force this question to the front.

At the present time it is not so necessary to add to the statistics we already possess as it is to make an intelligent and practical application of the lessons which they contain.

In confirmation of this statement I would say that three years since it was my privilege to read before the Section on Ophthalmology of the American Medical Association a paper on the subject of "School Children's Eyes," in which I took the ground that laws should be passed in every community compelling children to bring with them to school a certificate of the state of their eyes. A committee, of which the author was a member, was appointed to examine into the question and report the following year. The report made by this committee was subsequently discussed and its recommendation endorsed. The outcome has been the passage of a law in Baltimore which has been carried out, over 56,000 children having been examined in 1896.

We need then first of all proper legislation which shall provide for an examination of every child's eyes before commencing to go to school. This can only be done by persons trained in the work and by the most scientific methods, for but little good can come from examinations otherwise made. With his certificate of examination, the child takes to his teacher that which will at once provide the means for judging of his capacity for work. Until this method can be generally employed, teachers will have to be governed somewhat by personal observation of their pupils. The subject is, however, one requiring such highly specialized knowledge that teachers can never be expected to make the examinations themselves. Children exhibiting unusual phases of nervousness, inattention, restlessness, etc., or those who hold their eyes too closely to their books, who stumble over their reading, either from the distant blackboard or their books, should be looked upon as good subjects for such examination.

We should recognize the fact of the eye's limitations; that their capacity for work, especially at the near point, must be gauged by other standards than mere acuteness of vision.

The power of voluntary attention in children depends entirely upon their eyes, and to properly develop this somewhat complex phenomenon, by which the child's mind is caused to unfold and reveal its hidden possibilities, our most serious thought should be given.

The outlook for the future of our race rightly fills us with alarm, unless the proper course be taken to alter present conditions. Did time permit, we could dwell with profit on this phase of our subject; for the present we must rest with simply blazing a path for others to follow and complete the work so evidently necessary to be done.

As an optical instrument we have found that the eye is very often full of imperfections, it is either too long or too short, and it has spherical aberration. Its defects produce reflex disturbances in many portions of the body.

Helmholtz says that an optical instrument containing as many imperfections as does the eye would be thrown aside as useless, yet, with all its imperfections, the eye, it must be granted, is the most wonderful of all optical instruments for quickness and ease of adjustment for all distances, for its wonderful motility and its wide visual field. In a word, "the adaptation of the eye to its functions is therefore most complete."

[NOTE.—Professor Earl Barnes, of Stanford University, thinks that a general medical examination, including eyes, once every six months in all schools, with recommendations to parents advising them to consult specialists along needed lines,—teeth, eyes, etc.—would be even more practical than issuing certificates.]

COMPARATIVE OBSERVATIONS ON THE INDIRECT COLOR RANGE OF CHILDREN, ADULTS, AND ADULTS TRAINED IN COLOR.

By GEO. W. A. LUCKEY,
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Reprinted from The American Journal of Psychology, Vol. VI, No. 4.

Earl Barnes

COMPARATIVE OBSERVATIONS ON THE INDIRECT COLOR RANGE OF CHILDREN, ADULTS, AND ADULTS TRAINED IN COLOR.[1]

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The work already done in indirect color vision has been largely summed up in the original investigations of A. Kirschmann(1)[2], A. E. Fick(2), C. Hess (3) and A. Fick.(4)

Kirschmann, with others, has shown that only a small part of the retinal surface is sensitive to the fundamental color impressions; that the retina is sensitive to impressions of blue much farther from the centre than to any other color impression, or giving the eccentric range of the different colors, he finds (beginning with the color having the greatest range and proceeding toward the centre) blue, yellow, orange, red, green, purple, violet.

He finds, further, that "The action of the peripheral retina varies greatly, in different directions, from the centre, and that the ranges of all colors extend farther in the nasal and

[1]This investigation was made in the psychological laboratory of the Leland Stanford, Jr., University, and the writer desires in this connection to thank Dr. Frank Angell and Prof. Earl Barnes for helpful suggestions and criticisms, and also Mr. J. C. Hammel, and others, for kind assistance in the laboratory.

[2]The small figures in parenthesis refer to the bibliography at the end of the article.

upper parts than in the lower and temporal parts of the retina." He also finds that the size of the colored objects has much to do with the extent of the range.

A. E. Fick finds, in going over an investigation of Charpentier,[1] that there is considerable mutual assistance of separate neighboring retinal spots in the perception of color and of light. He also finds that the centre retina is more sensitive to color and form impressions, while the eccentric retina, as we pass toward the periphery, is more sensitive to light and motion impressions, but much faster to some colors than to others; and that intensity has influence on the perception of light, color, form and number, but just how great is not determined.

The paper of Hess, published in 1889, is a very careful re-investigation of peripheral color vision, both spectral and pigment colors having been used, and its results partly support and partly supersede those of previous experimenters. He finds equal color ranges for red and green, and for blue and yellow, when these colors are of the hue of Hering's original colors *(Urfarben)*.

A. Fick's study, to which reference has been made above, concerns itself with the theory of color vision, and only touches indirectly upon the work which the writer has in hand.

The present investigation has been like that of Kirschmann, in being a study of the eccentric color range, but different, in being a comparative study of the eccentric color range of individuals differing in age, sex and previous color training.

After nearly two months of preliminary testing of both the perimeter and a flat surface apparatus (campimeter), it was concluded that the former possessed more advantages, with fewer disadvantages, and for this reason all the results recorded in this paper, excepting those on the upper and lower vertical meridians, were made on the perimeter. In the writer's opinion the errors arising from unequal illumination in different parts of the perimeter[2] are more than counterbalanced by the variation in angular magnitude in the case of the campimeter, especially when, as in the case of these experiments, the perimeter was illuminated equally from the sides, from behind and from a skylight; all windows being slightly to the rear of the observer. In fact, the results obtained on either apparatus were almost identical up to about 30° from the fixation point, but for greater distances the results given by the

[1] Arch. d'opht. Juli-August, 1886.
[2] Kirschmann([1]) S. 600.

campimeter were from 1° to 15° less than those given by the perimeter, varying with the angle. It is difficult to see how accurate results can be obtained on the campimeter, when the angular magnitude is greater than 30° until we know more definitely the effect of size and intensity on color vision.

The only meridians in which the illumination of the perimeter was thought to vary were the upper and lower vertical meridians, and as the color range in these is small, the campimeter was used for them.

The perimeter apparatus consisted of a darkened steel rod, made in the form of a half-circle, fastened to a black wall by a screw at its middle point. This rod could therefore be adjusted in any desired meridian, the screw on which the perimeter turned being the point on which the uncovered eye of the observer was fixed. The observer was seated in an adjustable chair which carried a head rest. In this latter his head was placed, with his eye on a level with, and just two feet away from the fixed point, or at the centre of the curve of the perimeter. The only difference between the campimeter and the perimeter above described was the substitution of a dark rule, eight feet long, for the semi-circular rod. This was fastened to the wall in the same way and graduated to inches and projected degrees.

The colors used consisted of Bradley & Co.'s colored cylinders (familiarly known as the Hailmann beads). The cylinders were 12 mm. long and 12 mm. in diameter, and were perforated with a small opening from end to end, by means of which they were easily fixed on the end of a darkened steel rod 2 mm. in diameter and 1 m. long, used for moving them along the perimeter. The colors were first brought into the field of vision from the periphery by the operator, and the exact place on the perimeter noted at which the color could be recognized by indirect vision. The color was then placed at the centre and gradually moved toward the periphery until it lost all color, all changes in color, and the places at which they occurred, being also noted. One eye of the observer was continually covered, while the other was kept constantly on the fixed point during the time the color was moving to or from the centre. The latter was permitted to turn about, however, during the time the experimenter was recording the past result or was adjusting a new color. Six colors were used—red, orange, yellow, green, blue and violet; more colors became confusing and were not named with accuracy. Purple and violet could not be accurately distinguished in indirect vision even by those most practiced in color discrimination, *e. g.*, teachers

of painting. Two persons who had had considerable experience as art teachers said they could not tell, as violet was being brought toward the centre, whether it was going to be violet or purple, and were only sure when it was within a few degrees of the centre. Possibly this may be accounted for by the fact that we have little or no experience in color discrimination in the peripheral parts of the retina, and color sensations there are not only different from those at the centre, but have also not become grouped or classified. The above is only true, however, of tints and shades of the same color or of neighboring color mixtures, for, as Kirschmann(1) has observed, a spectral red, and a red carrying a little blue become noticeably different as they pass toward the periphery, the former changing to orange or yellow, the latter to blue. The same may be said of the other colors.

The colors used were supposed to be true imitations of the corresponding spectral colors, and were perhaps as exact imitations as it is possible for pigment colors to be. Fresh cylinders were used for each individual tested, so as to prevent all danger of change by use. Three double tests (*i. e.*, three tests with the color approaching the centre and three with color receding from the centre) were made with every color in every one of the eight meridians, and the average (range) of these tests taken as the one nearest correct.

The results obtained by the present investigation, in so far as they represent ground traversed before, agree with the results of Kirschmann(1), Fick(2) (4), Raehlmann (5), and others, in the following facts: (1) The ranges for the different colors were from 1° to 2° greater when the colors were moved from the centre toward the periphery than when they were moved from without toward the centre. (2) There are certain meridians in which the colors can be seen and recognized much further than in others. The upper nasal half of the retina is sensitive to colors farthest toward the periphery, while the under temporal part is sensitive to color over the least area. (3) The colors seem to arrange themselves in a certain definite order, according to the distance they can be seen in indirect vision. Beginning with the color having greatest range and proceeding toward the centre, we have first blue, then yellow, orange, red, green, violet. (4) The colors seem to fall into two rather noticeable groups—the blue-yellow group and the red-green group. Blue and yellow do not coincide in range but fall nearer together than in Kirschmann's investigation. The same is true of red and green. (5) As shown by Raehlmann(5) all the colors used entered the field of color vision as either blue or yellow (*i. e.*, yellow or orange). Blue and yellow

give no sensation of color when seen beyond their range, unless different shades of gray may be called color. Green is generally seen first as yellow, and a few degrees nearer the centre is recognized as green. Red is generally seen first as yellow, then as orange, then as red, though often it is seen first as orange then as red. Orange is generally seen first as yellow, and violet is always seen first as blue.

The following facts may be inferred from other investigations, but I believe have not been stated: *e. g.*, blue is the most stable and permanent of all the colors. It is never mistaken for any other color, enters the sensitive color field as blue and remains a blue throughout the entire field. Green, although its range is very much less, comes next to blue in permanency; while it is generally seen outside of its range as yellow, yet there is quite sure to be found a certain definite place on every meridian within which the same observer is sure of the color. Yellow is perhaps the most variable: for example, in all the tests made on the same individual the range for blue never varied more than 3°, and the subject always felt sure when blue entered the field, whether he expected it or not. In green, the variation (with the same observer) was never beyond 4°, but he was not quite so sure as with blue. With yellow, on the contrary, the observer often varied from 1° to 10°, and never felt quite sure but that the yellow might prove to be orange, or red, or even green.

Another interesting fact is that violet is seen as blue a degree farther than the blue itself, but is not recognized as violet until within the range for green.

The variation between yellow and orange, as mentioned by Kirschmann[1] was not confirmed by the present investigation, as yellow showed a greater range than orange in every one of the eight meridians, and came as near to blue in one meridian as in another.

The purpose of the present investigation was, however, less to study the general subject of peripheral color vision than to answer the following questions:

Can children see colors in indirect vision as far as adults?

Does sex have anything to do with difference in the range?

What influence has color education on the range?

As this study was for the purpose of establishing the comparative range, great care was taken that all the conditions should remain as nearly constant as possible. All tests were made on uniformly clear days, between 2 and 4 P. M. As soon as the observer showed signs of fatigue or

[1] S. 609.

inattention, the work ceased and was resumed at another time. The writer made all the tests himself (assisted by Mr. J. C. Hammel, a fellow student in psychology), in order that there might be uniformity in the manner of presenting the colors, although the observer was always kept ignorant of the order or of the color approaching. The difficulties which occur here are, for the most part, similar to those which occur in all experimental work in psychology and need not be mentioned. There was one difficulty, however, which at times became very annoying, especially in the work with children, and as the writer has failed to find it mentioned by others, a little space will be devoted to it here.

The eye of the observer is supposed to remain fixed on a small surface at the centre (5 mm. in diameter in these tests) during the time the colors are approaching or receding, but as the color enters the field of vision the attention is diverted from the fixation point to the approaching color, and as the attention becomes diverted the eye often unconsciously follows it a little. The same is true when the colors are receding. In this way it often occurs that the eye has changed from 1° to 10°, or even 15° in children, without the observer being conscious of the fact. Some way of overcoming the errors which would result from this change of vision is necessary, and as the observer is not conscious of the fact he cannot be trusted to tell when his eye has changed. To avoid the above error it was found necessary for the operator to watch constantly the eye of the observer and not to record any results in which the eye wavered from the fixation point. Such a control would obviously be inapplicable to the dark room experiments that others have preferred.

Now for the answers to the questions. First: Can children see color in indirect vision as far as adults? The writer first obtained the color range of ten adults who were students in the university, but found later that he could not get so many children of any one age, and selected from the adults six whose color range seemed to vary least. He then obtained the color range of six thirteen-year-olds, and next the color range of six children who were seven-year-olds.

In Tables I, II, III and IV are presented the results of these investigations. The figures indicate the number of degrees from the centre point at which the colored objects could be correctly seen, and represent the external visual field. When referred to the retina the meridians must, of course, be reversed, the outer horizontal meridian would, on the retina, be the *i. e.*, nasal meridian, etc., etc. The average results are shown by diagrams in the plates at the end of the article. These diagrams

TABLE I.

SEVEN-YEAR-OLDS. CLASS I.	MALES.						FEMALES.						Av. Range for every Meridian.		Av. Range for Light and Shade	
	A		B		C		D		E		F					
	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Outer Horizontal,	38	40	42	42	42	43	42	42	38	40	40	40	40⅓	41	67	67
Outer Low. Obliq.,	34	34	32	37	38	33	37	37	35	35	33	35	35	35	62	62
Lower Vertical,	25	24	28	28	25	25	28	27	25	27	23	24	25⅔	26	40	40
Inner Low. Obliq.	25	25	26	24	25	25	28	27	25	25	25	24	25½	25	41	42
Inner Horizontal,	29	28	27	26	29	27	28	28	28	29	26	26	28	27⅓	42	42
Inner Up. Obliq.,	27	28	24	24	24	24	25	25	24	26	22	24	24⅓	25	42	43
Upper Vertical,	18	18	19	19	18	18	20	20	17	19	17	18	18	18½	34	34
Outer Up. Obliq.,	25	28	26	29	30	30	28	31	27	31	25	26	27	29	51	50
Average Range,	26½	28	28	28½	29	28	29½	29½	27½	29	26½	27	28	28	47½	47½
Sex Average,	28						28								47.4	

ADULTS. CLASS III.	MALES.						FEMALES.						Av. Range for every Meridian.		Av. Range for Light and Shade	
	A		B		C		D		E		F					
	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Outer Horizontal,	79	80	72	73	76	75	72	70	78	70	74	74	75	74	86	86½
Outer Low. Obliq.,	70	70	70	70	67	68	65	66	70	65	62	64	67	67	82	82
Lower Vertical,	45	45	42	44	40	38	42	42	40	38	36	38	41	41	50	49
Inner Low. Obliq.	36	38	40	40	36	36	38	38	38	35	36	38	37	37	50	50
Inner Horizontal,	38	42	42	40	42	40	37	38	40	36	39	39	40	39	54	55
Inner Up. Obliq.,	32	36	38	40	34	35	34	36	34	34	35	37	34	36	56	53½
Upper Vertical,	35	35	33	33	32	34	35	34	35	34	32	33	34	34	47	47
Outer Up. Obliq.,	46	42	47	40	46	43	45	44	44	42	46	42	46	42	64½	64
Average Range,	48–	48+	48	47+	47–	46	46	46	47	44	45	46	47–	46+	61	61
Sex Average,	47.4						45.7									

THIRTEEN-YEAR-OLDS. CLASS II.	MALES.				FEMALES.								Av. Range for every Meridian		Av. Range for Light and Shade.	
	A		B		C		D		E		F					
	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Outer Horizontal,	53	52	55	56	50	53	57	60	52	57	55	57	54	56	80½	81
Outer Low. Obliq.	47	47	48	50	47	53	51	50	52	57	50	48	49	51	77½	77
Lower Vertical,	29	30	30	31	32	32	33	35	29	29	27	32	30	31⅓	48	48
Inner Low. Obliq.	31	31	29	29	34	31	28	30	28	27	30	30	30	29	46	46
Inner Horizontal,	30	26	32	29	28	28	33	28	28	28	34	33	31	29	49½	49½
Inner Up. Obliq.,	27	22	27	25	28	25	25	25	26	22	30	24	27	24	49	49½
Upper Vertical,	21	22	22	23	23	25	25	25	24	24	26	24	23½	24	42	41½
Outer Up. Obliq.,	30	31	32	34	33	34	31	35	37	35	32	35	32	34	58	59
Average Range,	33½	33–	34+	35–	34+	35	35	36	34½	35	35½	35+	34½	35	56.3	56.4
Sex Average,	34–				35											

ADULTS TRAINED IN COLOR. CLASS IV.	MALES.				FEMALES.								Av. Range for every Meridian.		Av. Range for Light and Shade.	
	A		B		C		D		E		F					
	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Outer Horizontal,	78	83	75	75	82	82	75	77	73	75	68	69	75	77	86	85
Outer Low. Obliq.	72	74	64	66	76	72	65	64	65	67	65	60	68	66½	80	81
Lower Vertical,	40	41	42	40	42	43	37	37	42	43	43	43	41	41	50	51
Inner Low. Obliq.	35	33	38	36	37	36	38	37	41	40	35	35	37	36	50	50
Inner Horizontal,	42	48	43	43	38	38	37	41	41	42	36	37	40	41	56½	55½
Inner Up. Obliq.,	35	39	42	38	37	37	36	35	44	41	36	36	38	38	57	54+
Upper Vertical,	38	34	30	30	32	31	29	29	31	32	34	34	32½	32½	47	47
Outer Up. Obliq.,	42	47	37	42	41	42	42	38	40	42	38	45	45	42½	61	62
Average Range,	48	50	46	46	48	48	45	45	47½	48	44	45	47	47	61	60.6
Sex Average,	47.5				46.2											

The External Visual Field for Blue.

The above represents the average results of three double tests of each individual through all the meridians as indicated. On this chart, in column eight, is also represented the average range for light and shade of each class. The letters, A, B, C, D, E, F, represent the different individuals of each class. R, right eye; L, left eye.

TABLE II.

SEVEN-YEAR-OLDS. CLASS I.

	MALES.						FEMALES.						Av. Range for every Meridian.	
	A		B		C		D		E		F			
	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Outer Horizontal,	35	37	40	40	38	38	30	32	33	33	33	30	35	35
Outer Lower Oblique,	32	26	35	38	33	32	29	26	33	30	28	28	31	30
Lower Vertical,	21	20	27	27	23	20	25	25	20	21	20	20	23	22
Inner Lower Oblique,	24	21	22	22	24	22	23	24	20	25	24	19	23	22
Inner Horizontal,	28	29	25	22	26	22	20	21	24	27	24	24	24½	24
Inner Upper Oblique,	25	25	19	21	18	19	20	18	19	21	20	16	20	20
Upper Vertical	14	14	18	18	16	16	16	16	16	18	15	15	16	16
Outer Upper Oblique,	23	25	24	27	19	20	17	27	25	21	20	19	21	23
Average Range,	25+	25–	26	27	25	24	23	24	24	25	23	21	24	24
Sex Average,	25						23							

ADULTS. CLASS III.

	MALES.						FEMALES.						Av. Range for every Meridian.	
	A		B		C		D		E		F			
	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Outer Horizontal,	78	74	76	73	72	73	76	67	76	70	70	71	75	71
Outer Lower Oblique,	70	64	67	64	57	57	63	56	64	57	55	56	63	59
Lower Vertical,	42	42	38	43	35	34	45	42	42	42	34	36	39	39
Inner Lower Oblique,	30	36	40	40	37	38	32	34	38	32	36	34	35	36
Inner Horizontal,	42	42	40	37	40	38	37	37	40	35	36	38	39	38
Inner Upper Oblique,	33	36	40	40	37	34	31	35	34	31	30	30	34	34
Upper Vertical	37	37	34	34	32	33	35	35	38	30	33	34	35	34
Outer Upper Oblique,	46	45	47	45	47	46	46	45	43	45	44	43	45	45
Average Range,	47	47	48	47	45	44	46	44	47	43	42	43	46	44
Sex Average,	46.3						44							

THIRTEEN-YEAR-OLDS. CLASS II.

	MALES.				FEMALES.								Av. Range for every Meridian.	
	A		B		C		D		E		F			
	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Outer Horizontal,	55	52	57	55	45	54	55	59	54	54	57	57	54	55
Outer Lower Oblique,	44	46	45	48	45	54	53	50	53	49	50	48	48	49
Lower Vertical,	30	30	30	31	30	30	35	33	25	29	27	31	29	31
Inner Lower Oblique,	34	28	28	30	35	30	28	30	25	26	31	26	30	28
Inner Horizontal,	32	25	30	28	29	28	33	28	26	28	27	32	29	28
Inner Upper Oblique,	25	26	25	26	30	30	28	25	27	23	26	28	27	26
Upper Vertical,	20	22	18	23	22	20	26	25	21	20	23	26	22	23
Outer Upper Oblique,	28	28	27	30	30	31	33	35	40	35	32	33	32	32
Average Range,	33½	32	32	34	33	34	36	36	34	33	34	35	34	34
Sex Average,	33				34.5									

ADULTS TRAINED IN COLOR. CLASS IV.

	MALES.				FEMALES.								Av. Range for every Meridian.	
	A		B		C		D		E		F			
	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Outer Horizontal,	78	82	65	73	82	83	75	70	70	71	75	69	74	74½
Outer Lower Oblique,	55	66	47	46	70	70	58	52	60	64	65	64	59½	60½
Lower Vertical,	37	38	33	31	43	45	33	34	43	43	43	43	39	39
Inner Lower Oblique,	35	32	36	36	35	35	35	32	39	39	32	33	35	34½
Inner Horizontal,	37	44	38	43	34	38	35	36	40	40	34	36	36	39
Inner Upper Oblique,	35	38	38	38	35	37	32	33	41	42	34	33	36	37
Upper Vertical,	35	32	34	30	27	33	30	30	30	31	30	30	31	31
Outer Upper Oblique,	37	43	38	38	38	43	37	37	40	40	36	45	39	41
Average Range,	45½	48	42	40	46	47	44	45	44	44½				
Sex Average,	43.4				44.5									

The External Visual Field for Yellow.

The above chart represents the average results of three double tests of each individual through all the meridians as indicated. The letters A, B, C, D, E, F, represent the different individuals of each class. R, right eye; L, left eye.

TABLE III.

Seven-Year-Olds. Class I.

	Males. A R	A L	B R	B L	C R	C L	Females. D R	D L	E R	E L	F R	F L	Av. Range for every Meridian. R	L
Outer Horizontal,	30	30	31	30	35	36	30	32	27	28	30	31	30	31
Out. Lower Oblique,	26	26	26	27	30	30	29	27	29	25	25	25	27	27
Lower Vertical,	19	20	20	20	17	17	21	21	18	19	19	19	19	19
In. Lower Oblique,	19	18	18	17	18	18	17	20	16	20	22	17	18	18
Inner Horizontal,	21	22	21	18	20	18	15	17	19	25	19	19	19	20
In. Upper Oblique,	20	19	16	16	16	20	17	16	17	20	18	16	17	18
Upper Vertical,	15	15	12	12	15	15	13	13	14	16	13	13	14	14
Out. Upper Oblique,	17	20	16	18	22	21	16	18	22	23	21	19	19	20
Average Range,	21	21	20	20	22	22	20	21	20	22	21	20	20	21
Sex Average,	20						20.5							

Adults. Class III.

	Males. A R	A L	B R	B L	C R	C L	Females. D R	D L	E R	E L	F R	F L	Av. Range for every Meridian. R	L
Outer Horizontal,	56	50	51	48	46	47	46	46	46	45	45	47	49	47
Out. Lower Oblique,	30	30	37	38	34	35	30	34	36	33	33	32	33	34
Lower Vertical,	20	20	23	20	23	25	25	26	20	22	22	23	22	23
In. Lower Oblique,	23	20	24	25	22	22	25	24	26	22	24	24	24	23
Inner Horizontal,	27	25	25	22	24	23	24	24	28	26	25	24	25	24
In. Upper Oblique,	22	25	28	27	25	23	22	22	27	22	22	23	24	25
Upper Vertical,	17	17	20	17	19	18	21	20	19	19	17	18	19	18
Out. Upper Oblique,	25	27	25	28	24	23	27	28	23	24	23	22	24	25
Average Range,	27	27	30	28	27	27	29	29	28	27	27	27	29	27
Sex Average,	27.8						27.2							

Thirteen-Year-Olds. Class II.

	Males. A R	A L	B R	B L	Females. C R	C L	D R	D L	E R	E L	F R	F L	Av. Range for every Meridian. R	L
Outer Horizontal,	33	35	35	36	33	35	31	37	39	35	34	35	34	36
Out. Lower Oblique,	30	27	31	26	32	29	31	30	32	30	32	32	31	29
Lower Vertical,	20	20	20	20	19	18	19	19	16	20	17	21	18	20
In. Lower Oblique,	20	18	18	19	21	20	20	19	20	17	22	21	20	19
Inner Horizontal,	22	20	20	21	20	20	21	20	20	20	21	22	21	21
In. Upper Oblique,	19	21	20	19	21	20	19	17	20	17	20	19	20	19
Upper Vertical,	15	16	15	16	17	18	17	16	17	15	16	16	16	16
Out. Upper Oblique,	21	20	20	21	22	19	22	20	21	23	22	24	21	21
Average Range,	23	22	22	22	23	22	23	22	23	22	23	24	23	23
Sex Average,	22				22.7									

Adults Trained in Color. Class IV.

	Males. A R	A L	B R	B L	Females. C R	C L	D R	D L	E R	E L	F R	F L	Av. Range for every Meridian. R	L
Outer Horizontal,	60	60	53	52	55	50	54	55	51	50	52	52	54+	53+
Out. Lower Oblique,	35	42	34	35	36	42	42	41	40	42	35	32	37	39
Lower Vertical,	25	22	26	26	25	28	24	23	33	32	31	30	27+	27–
In. Lower Oblique,	21	24	28	29	24	27	30	28	26	27	25	26	26–	27
Inner Horizontal,	27	30	32	32	25	30	30	31	27	33	28	27	28+	30½
In. Upper Oblique,	30	29	34	28	28	29	28	27	25	26	26	27	28½	28–
Upper Vertical,	26	20	21	20	22	23	21	21	20	20	23	22	22+	21
Out. Upper Oblique,	35	30	30	33	33	30	35	32	28	30	25	32	31	31+
Average Range,	32	32	32	32	31	32	33	32	31	32½	30½	31	31.7	32+
Sex Average,	32.2				31.7									

The External Visual Field for Red.

The above chart represents the average results of three double tests of each individual through all the meridians as indicated. The letters A, B, C, D, E, F, represent the different individuals of each class. R, right eye; L, left eye.

TABLE IV.

Seven-Year-Olds. Class I.

	Males. A R	A L	B R	B L	C R	C L	Females. D R	D L	E R	E L	F R	F L	Av. Range for every Meridian. R	L
Outer Horizontal,	23	27	25	27	25	25	24	28	21	23	20	20	23	25
Outer Lower Oblique,	23	24	23	24	22	19	23	25	21	19	21	21	22	22
Lower Vertical,	14	14	15	17	15	15	18	18	16	16	17	17	16	16
Inner Lower Oblique,	15	14	11	13	14	14	13	13	12	15	15	14	13	14
Inner Horizontal,	17	18	13	18	15	15	14	14	15	18	15	13	15	16
Inner Upper Oblique,	17	16	12	13	13	15	14	14	13	14	14	13	14	14
Upper Vertical,	11	11	11	12	12	12	11	11	12	13	11	13	11	12
Outer Upper Oblique,	15	16	14	15	17	17	14	15	18	17	17	14	16	16
Average Range,	17	17½	15½	17–	17	16½	16+	17	16	17	16	16–	16	17
Sex Average,	17–						16.5							

Adults. Class III.

	Males. A R	A L	B R	B L	C R	C L	Females. D R	D L	E R	E L	F R	F L	Av. Range for every Meridian. R	L
Outer Horizontal,	43	42	44	40	37	37	44	42	40	43	42	43	42	41
Outer Lower Oblique,	30	30	36	35	33	30	31	31	32	30	32	31	32	31
Lower Vertical,	20	20	25	23	20	23	23	26	20	25	22	20	22	23
Inner Lower Oblique,	21	20	20	26	22	21	20	23	22	20	20	21	21	21
Inner Horizontal,	22	20	20	22	23	23	25	25	23	25	21	23	22	23
Inner Upper Oblique,	20	21	25	26	23	24	21	20	19	18	18	20	21	21
Upper Vertical,	19	18	18	19	17	16	21	20	18	20	18	19	18½	19
Outer Upper Oblique,	24	28	24	27	24	23	26	26	22	23	28	27	25	26
Average Range,	25	25	27	27	25	25	26	27	24½	25½	25	25½	24.4	26
Sex Average,	25.5						25.6							

Thirteen-Year-Olds. Class II.

	Males. A R	A L	B R	B L	Females. C R	C L	D R	D L	E R	E L	F R	F L	Av. Range for every Meridian. R	L
Outer Horizontal,	32	31	35	32	33	33	33	32	38	35	27	31	33	32
Outer Lower Oblique,	27	27	28	28	28	25	31	28	30	28	25	29	28	28
Lower Vertical,	17	18	18	17	18	16	16	18	16	19	18	19	17	18
Inner Lower Oblique,	18	19	17	18	19	19	15	18	17	16	18	17	17	18
Inner Horizontal,	18	20	17	19	17	19	20	20	18	20	18	20	18	20
Inner Upper Oblique,	16	16	18	17	20	20	16	18	18	17	16	18	17	18
Upper Vertical,	14	15	14	15	17	14	17	17	16	15	14	14	15	15
Outer Upper Oblique,	19	18	17	17	20	16	17	17	19	20	17	16	18	17
Average Range,	20	21	21	21	23	20	21	21	22	21	19	21	20	21
Sex Average,	20.5				20.7									

Adults Trained in Color. Class IV.

	Males. A R	A L	B R	B L	Females. C R	C L	D R	D L	E R	E L	F R	F L	Av. Range for every Meridian. R	L
Outer Horizontal,	37	40	31	32	43	38	33	34	40	40	30	32	36	36
Outer Lower Oblique,	26	32	26	27	35	28	28	30	33	33	30	27	30–	30–
Lower Vertical,	23	20	21	21	22	20	22	22	26	26	24	24	26–	24+
Inner Lower Oblique,	22	20	21	24	22	20	22	25	25	26	22	25	22	23
Inner Horizontal,	26	30	27	26	24	23	24	25	24	27	23	25	25	26
Inner Upper Oblique,	18	24	22	22	18	20	25	24	24	24	21	21	21	22½
Upper Vertical,	19	18	16	16	16	18	18	18	18	17	17	18	17	17½
Outer Upper Oblique,	22	25	26	22	21	21	23	27	22	22	21	22	22½	23
Average Range,	24	26	24	24	25	23½	24	25½	26½	27	23½	24	24½	25
Sex Average,	24.5				25									

The External Visual Field for Green.

The above chart represents the average results of three double tests of each individual through all the meridians as indicated. The letters A, B, C, D, E, F, represent the different individuals of each class. R, right eye; L, left eye.

also represent the external visual field, and must be reversed in order to represent the retinal color fields. In the tables and diagrams the results of only four colors (R. Y. G. B.) have been represented, as these seemed sufficient to illustrate the point and less confusing than more colors would have been.

On examining these tables one is impressed with the general similarity of the fields in persons of different ages. The general form of the visual field is, in all cases, somewhat elliptical, but more circular in youth. The extent of the visual field is evidently larger in the adults, and so uniformly is this the case that it seems safe to answer the first question, "Can children see colors in indirect vision as far as adults?" in the negative.

Representing the average range for the adult eye for the four colors as 100, the average for the thirteen-year-olds would be represented by seventy-seven, and the seven-year-olds by sixty-one. This, expressed in retinal surface, would be in the ratios of 100, fifty-nine, and thirty-seven respectively. The greatest difference in the range was found with the blue and the least with the red. The order, beginning with the color showing the greatest difference and ending with the one showing the least difference, is blue, yellow, green, red. There is, however, one exception to this order in case of the seven-year-olds, where yellow presents a greater difference than even blue. (See table.) Perhaps this can be accounted for in the hesitancy of the children to speak as soon as they received a sensation of yellow. The observer was always requested to speak as soon as he received any sensation of color whether it should prove to be true to the color approaching or not, but the children soon learned that what seemed to be yellow, might, on appreaching nearer, prove to be orange, red or green, and would often hesitate until they felt quite sure that it was yellow. The writer endeavored to overcome this cautiousness but was not entirely successful.

The question that now arises is: Why cannot children see color in indirect vision as far as adults? The discussion of this problem would require a paper in itself and must be deferred; however there are a number of points which present themselves. There are just as many degrees in the child's eye as in the adults, and so far as is definitely known, the retinal layer extends as far forward in the one as in the other. The difference in the convexity of the crystalline lens favors the child. We can hardly account for it through inattention, for the thirteen-year-olds seemed to be able to give as close attention to the approaching color as the adults, yet they

could recognize color only three-fourths as far. Again, the seven-year-olds could see objects 78% as far as adults, while they could see color only 61% as far. Although it is difficult to decide what the true cause is, yet the writer believes that the cause must be looked for in the order of the color development itself, whatever may be regarded as the true theory of color vision. Beginning with the visual color field, as seen by the adult, and passing backward toward and through the visual field of the child, we notice that the field not only decreases in extent but also becomes more circular. The same is true of the general visual field, *i. e.*, the visual field for light and shade, only the latter field decreases much less rapidly, or, in other words, shows a much greater proportional range in children than the color field. Now, should we continue still farther backward, and this law hold true, we should finally reach a point in the child's development where the eye ceased to be sensitive to color impressions; and from previous observations on young children, the writer would place this point not earlier than the fourth week of life, if as early as that. Perhaps no one will doubt the statement that the child becomes sensitive to light and shade much sooner than to color as color. A very young child may be attracted by a bright color, not on account of the color but on account of the light it contains. The above observations show that light and shade either develop faster in children than color, or else start sooner to develop, for while the range for light and shade of the seven-year-olds, as compared with adults, stands seventy-eight to 100, color, for the same individuals, stands as sixty-one to 100, linear measure. The writer very much questions whether his own children were able to perceive blue before they were eighteen months old, while they knew and seemed to enjoy red, orange and yellow very much earlier. If it be true that blue is the last of the colors to be perceived by the child, it becomes interesting to know why in after life blue has the greatest range of all the colors.

Judging from all the evidence at hand it seems probable that the child inherits from past generations an ever increasing color tendency, but nothing more, that he must come in contact with the real colors, or, in other words, the different color stimuli must play on the retina in order to develop this color tendency into a real mechanism for the discrimination of color, and that this mechanism begins to develop in earliest childhood, develops slowly and is finally completed in adult life. Further discussion of this point must be reserved for a future paper.

The second question was: Does sex have anything to do with difference in the range? There is a prevalent belief that woman has a better color eye than man, *i. e.*, greater inherent power of seeing and discriminating color, and that there are more color-blind men than women. The writer doubts, however, whether these beliefs are founded on facts. At least a carefully arranged and conducted experiment on 200 children (a number too small, perhaps, for accurate judgment) showed practically no sex differences in color vision. In the present experiment on visual range the data are entirely too limited to warrant any definite conclusions in the matter of sex, but the figures at least do not show that woman possesses any color superiority over man. In Tables I to IV, we find in Class III, designated adults, where there were three male and three female observers, that the average range for the males with blue was 47.4°, for the, females, 45.7°; the range of yellow, for males, 46.3°, for females 44°; the range of red, for males, 27.8°, for females, 27.2°; the range of green, for males, 25.5°, for females, 25.6°, or representing the average range of all colors for males at 100%, the average range for females would be 97%. Also in Class I (the seven-year-olds), where all the conditions were equally favorable to both sexes, we find again the males leading by 2%, or representing the average range of the boys for all colors as 100%, the average range for the girls would be represented by 98%. In Classes II and IV we find the conditions less favorable, for in each of these classes there were only two males and four females. Besides, in the class of thirteen-year-olds, where we should expect, if anywhere, to see a difference, the average age of the boys was nearly a year less than that of the girls, and this of itself may have been sufficient to account for the difference in the range in favor of the girls. Representing the average range of the boys as 100%, the average range of the girls would be 103%. In Class IV, where there were two men and four women, the average range favored the men by only 0.1%, or again representing the average range of the men as 100%, the average range of the women would be 99.9%.

These figures, so far as they show anything, show that man possesses not only equal power of recognizing the fundamental colors, but also equal retinal surface sensitive to color.

Let us now turn to the third and last question: What influence has color education on the extent of the range? To the answer of this question the writer brings the results of his observations on twelve different individuals, six of whom were selected from students of the university who had had

no special training in colors, and six others of equal age selected from the students and instructors of the Art Department who had had three or more years of special training in color.

In selecting the first class the author relied on his own judgment, but in selecting the second class he relied principally upon the judgment of Prof. Brown of the Art Department, who himself kindly submitted to the test, and endeavored to recommend only persons who showed special talent in color discrimination and in color harmony. The one class is indicated in the tables as "Adults, Class III," the other, as "Adults trained in color, Class IV."

Perhaps the best and only sure way to answer this question would be to select a number of individuals of the same age and of equal color range, giving to half of them three or four years of special color training, while the others were educated along other lines, without particular reference to color, and then take the color ranges again and compare. But in the absence of data gathered under these conditions, the present carefully made observations are of interest.

Table I shows that with blue the ranges for both the trained and the untrained were practically the same. With yellow, the range was greater for those untrained; while with red there was a decided difference in favor of the trained. The range for green was slightly greater in those untrained. Representing these in percentages and indicating the range of the untrained each time by 100%, we have the following results: The average range for blue in the untrained, 100%, in the trained, 100.2%; the average range for yellow in the untrained, 100%, in the trained, 97%; the average range for red in the untrained, 100%, for the trained, 115%; the average range for green in the untrained, 100%, in the trained, 97%. If the average range for all colors in the untrained were indicated by 100%, the average range for the trained would be 101.8%. This difference, although favoring those trained in color, falls within the individual variations of the same class, and is too small to be taken into account in tests of this kind. And judging both from the figures and the many impressions received during the time the tests were being made, the writer is forced to conclude that color education, as generally understood, has no influence on the color range. But is not this conclusion opposed to the one reached in answer to the first question? If correctly understood it is not. There are two kinds of color education, the direct and the indirect, the conscious and the unconscious, and it is on the indirect and unconscious sort of education, in which all share alike, that the widening of the color field depends.

That these incidental color experiences are necessary to the development of the range is shown by the general form of the color range itself. On the meridians which the nose and eyebrows shield from the color impressions, the retina is sensitive to color over only a few degrees as compared with the rest.

We mean something quite different, however, when we speak of direct color education. When an individual receives color instruction the colored objects are not brought to play on the periphery, but on a small spot at the centre of the retina, and here all color education or training, in the general acceptation of the term, takes place.

There is, therefore, no reason for thinking that those trained in direct color vision ought to see farther in indirect vision than the untrained.

Of other points of interest in this comparison of the trained and untrained may be mentioned the marked difference in the range for red in favor of the trained, of yellow in favor of the untrained, and the greater variety of shades seen by the trained, as well as the greater uncertainty in naming the true color. What color training really does, is to increase the number and variety of the color tones consciously recognized, but it does not increase the amount of retinal surface sensitive to color, and the greater the variety of color tones seen by an individual, the less accurate he becomes in naming the fundamental colors by indirect vision.

Another rather interesting fact was the not unusual occurrence of small color-blind surfaces in eyes otherwise apparently normal. These surfaces varied from 2° to 10° in breadth. Such a color-blind area can be seen in the Tables I to III, by referring under "Class IV" to the outer upper oblique meridian of the right eye of "F." In this case the color-blind area was so situated as to reduce the limit of vision on this meridian several degrees as compared with the other eye. The persistence and irregularity of these spots in some individuals was quite marked.

Again, in the examination of a person who was red-green color-blind, there were found small unequal areas in the excentric retina of both eyes (near the normal limit for red and green), where all the fundamental colors could be correctly distinguished.

It appears, then (to sum up), 1st, that children cannot see colors as far in indirect vision as adults, but as compared with adults they show a greater proportional range for black and white than for color.

2nd. Difference in sex seems to make no perceptable difference in the extent of the color range.

3d. Color training does not seem to increase the color range (except perhaps in the case of red), but makes itself felt in a greater variety of shades and tints to the colors as seen in indirect vision, and less accuracy in naming the fundamental colors by indirect vision.

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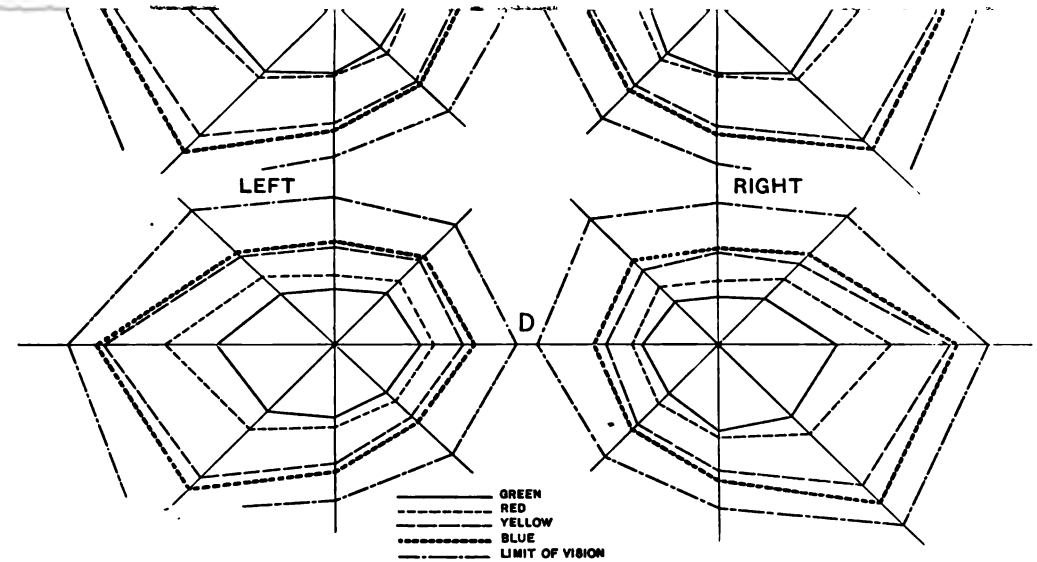

EXPLANATION OF CHARTS 1 AND 2.

CHART 1. A represents the average projected color field of the left and right eyes of six children seven years old. B represents the average projected color field of six children thirteen years old.

CHART 2. C represents the average projected color field of six adults. D represents the same field of six adults who had had three or more years special training in color. The line marked "limit of vision," is the average distance at which the class could see a white object of the same size as the colored objects used. By an unfortunate error in the reproduction of the original drawings Chart 2 is not shown on the same scale as Chart 1, but on a scale nearly one tenth smaller. For this reason the limits of vision in C and D seem smaller than in B, though in reality they are clearly larger.

The straight radiating lines are the meridians along which the colors were brought into the field of vision.

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CHILD-STUDY FOR SUPERINTENDENTS

What work in child-study can superintendents practically and profitably undertake? The following paper is devoted to a consideration of this question and divides the subject into two parts; First, a brief survey of some of the work actually being done by departments of superintendence in some of our cities and States, and secondly, a summary of the lines of work that have been shown to be practicable as well as productive of valuable results, and which are therefore strongly recommended to the attention of all supervisors of schools.

The attempt will not be made to give any exhaustive account of what is being done, but representative work will be mentioned in order to show its practicability.

Beginning with New England and naturally with Boston, we have some valuable investigations made by the Director of Physical Training. Dr. Scudder's Report on the Seating of Pupils in the Public Schools (1892) informs us that twenty per cent. of the girls in the grammar grades are decidedly round-shouldered, and that the method of seating tends to the production of permanent deformity of the spine. Statistics of age, height of children, and size of desk are given, together with photographs of malpositions assumed by children when there is disproportion in size between child, desk, and seat.

Dr. Hartwell's Report in 1894 is one of the most impor-

tant on school hygiene ever issued in the United States. In it he showed that Boston children of school age die faster than London and Berlin children, owing to the inferior sanitation in Boston, and he further discussed the means of meeting the difficulty. He gave tables showing Boston death rates and specific intensity of life for each sex at individual ages, from birth to twenty-one years; he showed that "during the period from ten to fifteen years, the years characterized by most rapid growth in height and weight, are years in which the fewest deaths occur." These years are not the same for both boys and girls. For boys the year is the thirteenth; for girls the twelfth. Thus girls reach their maximum of vigor earlier than boys.

It is scarcely necessary to point out the importance of minimizing all influences that hinder, and of magnifying all influences that promote, the growth of school children before their tide of exuberant vitality and of active growth begins to ebb. The specific intensity of life and the rates of growth in height and weight decline markedly for both sexes after the sixteenth year. Dr. Hartwell then proceeds to a study of stuttering in school children and shows that it is a neurosis of development. He compiled tables of the stutterers and showed that the years when girls were most subject to the disorder were seven, twelve, and sixteen; and that the corresponding ages for boys were eight, thirteen, and sixteen. The rise in the ratio of stutterers at seven and eight he attributes to the faulty methods of language-training in kindergarten and primary school.

This exceedingly valuable Report by Dr. Hartwell concludes with a further study of the problem of seating pupils and gives the norms for ages and heights.

The later Reports by the same authority continue the statistics and give further recommendations on these important points. As long ago as 1872 Superintendent Philbrick declared that "we ought to aim, not merely to avoid injuring the health of the pupils while carrying on their instruction in our schools, but to increase their physical

health, strength, and beauty." Without studying their physical conditions and requirements, we can never be certain that we are not injuring the health of the children, and these studies show that the schools were, and perhaps are still, injuring instead of promoting health.

Dr. Hartwell's work was based in part on Dr. Bowditch's earlier measurements of Boston children, which led to Porter's work in St. Louis, Peckham's in Milwaukee, and Greenwood's in Kansas City. These investigations have formed the basis of exceedingly interesting and important papers on "The relation between growth and disease,"[1] "The physical basis of precocity and dullness,"[2] and "The relation between the growth of children and their deviation from the physical type of their sex and age."[3] Many of these and other points of growth in its relation to the development of children are summarized in convenient and accessible form in Donaldson's recent volume on the *Growth of the brain.*

Superintendent Greenwood has made very important contributions to the subject of the comparative development of boys and girls. He says that girls, especially in the high school, learn more rapidly than boys and usually stand much higher in their classes, and that this is doubtless owing to the fact that they cease to grow rapidly at an earlier age than boys and that, therefore, their systems have attained a higher degree of solidity than those of boys of corresponding age. Hence, he thinks, the intellectual educational stress should be the least possible on the system at the period of greatest growth and, in accordance also with Aristotle's recommendation, the hard study and severe discipline of the mental powers should come at puberty, in the two or three years immediately following the period of maximal growth. Superintendent Hancock of Durango, Colo., writes me that the boys at eight and fourteen, and the girls at ten, seem to lose their reasoning power to a large extent.

[1] H. P. Bowditch in *Transactions of American Medical Association*, 1881.

[2] W. Townsend Porter in *Transactions of the Academy of Science of St. Louis*, vol. vi. 7.

[3] Ibid., vol. vi. 10.

He finds it necessary to accord them different treatment at these periods. Mr. Johnson of Andover, Mass., also reports the dullards most numerous at these periods, while they brighten up somewhat in the next following years.

It is unnecessary here to dwell on the importance of making such studies as these on the physical growth and the hygiene of development. Excessive study, overstrain in late hours, and loss of sleep, at this critical stage of maximal growth, will sap the foundation of the most vigorous constitutions, and start those germs of future weakness that too often last throughout life.

One of the most practical results of the superintendent's knowledge of child-study and being himself a worker in the field is the Play School conducted by Superintendent E. G. Johnson at Andover, Mass. Several years ago Mr. Johnson made a very suggestive study of one thousand classified plays and games,[4] showing how to turn on the play-activity in the direction of accomplishing work. Play is, in fact, normally the early stage of work and the preparation for it. Just as in the kindergarten the occupations are plays in the line of the child's future activities, so even Plato had recommended that children's plays should be directed into the line of their future pursuits and thus made a preparation for their life work.[5]

This Play School at Andover is not connected with the day school, but is a sort of boys' club, meeting two evenings a week under the oversight of the superintendent. The members are mostly boys who had been hard to get along with in the regular school work. Here are two sample programmes:

A—(1) roll call, (2) checkers, dominoes, or parchesi, (3) spelling game, Crimsons *vs.* Blues, (4) parlor magic (to test watchfulness), (5) rifle practice, (6) boxing, (7) dismissal.

[4] *Pedagogical seminary*, vol. iii. No. 1.

[5] Professor S. T. Skidmore of the Philadelphia Girls' Normal School has proposed in his *Evolution of play* to let the savage and hunting games die out, while mechanical constructiveness takes their place, as being more in harmony with the spirit and the demands of the present age.

B—(1) roll call, (2) choosing sides, (3) conundrums, Greens *vs.* Reds, (4) puzzles, (5) checker match, (6) wrestling,(7) dismissal, with books and papers to read. Benches and tools are also introduced, and, this year, Mr. Johnson tells me, he intends to utilize toy-making as manual training. The boys are steadily improving in attention, foresight, and judgment.

Mr. Johnson has also made other studies of games and plays in conjunction with his teachers, has tested children's hearing in relation to mistakes in spelling, has made some tests on motor-ability and nervousness, and has under way a short investigation into children's favorite studies.

In Michigan, too, the teachers have organized State spelling contests in at least twenty-five counties, and an account of these is published in the advance pages of Superintendent Pattengill's Report for 1896.

Dr. Spaulding, superintendent of Ware, Mass., gives a considerable part of his last Report to child-study. Tests of sight and hearing have been found so necessary that he contemplates having all the pupils tested hereafter twice a year. Besides teachers' meetings once a month, devoted to addresses on the subject and to directions for careful observation and study of children and the keeping of records, many suggestive points have been brought out through the regular language lessons by having the children write on topics that closely concern their interests and about which they know a great deal, which they are delighted to have the opportunity of expressing. Thus they tell, with the naïvest childish frankness, " of the happiest day in their lives, when it was and what made it so ;" " what they want to be when they grow up; " " the stories they have read or heard during the year and which they like the best;" " their favorite games and why they like them;" they write to an imaginary friend, telling all about themselves that they think will be of interest to their friend, etc. The success of this method evidently depends on the sagaciousness of the topics assigned for the essays; but the testimony of the superin-

tendent is that it has proved the most profitable lesson of the week in language and is a complete success in securing valuable insight into the child's mental life, without either burdening the teacher or harassing the children. This method has been employed with the best of results by Superintendent Kratz in preparing the data for several of his studies of children, and by many city and county superintendents in California and elsewhere in co-operation with Professor Barnes.

Superintendent Balliet of Springfield writes me that he has had so many new teachers to break in of late years that it has taken all his time and strength to teach them the rudiments of pedagogics. In a paper read in 1890 before the Department of Superintendence, he expressed himself very strongly on the necessity of relieving the superintendent from the routine and administrative duties of secretary of the board, agent in distributing supplies, clerk of statistics, and examiner of the manuscript tests in the different grades; so that the superintendent may devote himself to training the teachers to observe children, to interpret their observations, and to deduce from them the principles that must guide them in teaching. In a recent letter to me, Mr. Baillet says that his experience shows that eye and ear tests are entirely practicable and necessary; growth and weight records might possibly be kept by most teachers; tests for nervousness (chorea) can be made with profit, and well-trained teachers can be instructed in the methods of making other tests on stuttering, motor-ability, contents of children's minds, etc.

Some of the city superintendents in New England are co-operating with child-study clubs, as, for instance, Superintendent Baldwin of Belmont, Mass., and Superintendent Tarbell at Providence, R. I. The Belmont Education Society has issued a neat syllabus of suggestions for the study of children in the home and school, including some very well-put questions and a particularly good outline for a study of play. The movement resulting in the formation of this society

grew out of a desire to secure a more active co-operation on the part of teachers and parents. The preliminary meeting was held in January, 1896, at the call of the School Committee. Superintendent Dutton of Brookline assisted at the organization and gave an account of the work of the Brookline Education Society along somewhat similar lines.

Worcester is so near the heart of the child-study movement and the source of its greatest inspiration that, even without any special child-study organization, Superintendent Carroll and Miss Howes have, nevertheless, aided materially in a great deal of the work. The school committee has been most willing and the superintendents most cordial in co-operating with studies made from Clark University under President Hall's direction. The school of observation, in connection with the work of the apprentices, is also, with great discretion, used as an experiment school for trying new ideas on a small scale before requiring their general adoption in the other schools.

The value of such a school can scarcely be overestimated. Here new ideas can be welcomed by bright, expert, and tactful teachers; and, under their direction and their application of these ideas in the schoolroom, the way may be opened for improvements in the adaptation of the methods and material of instruction to the interests and capacities of growing children. It serves the same purpose in education as do the experiment farms of the Agricultural Department in maturing new and improved methods of farming. The value of an educational museum and pedagogical library, such as is advocated in the Report of the Secretary of the Board of Education of Massachusetts, would be of great assistance in connection with such schools, and would exert a powerful influence in keeping the schools abreast of the best thought and best methods.

Several of the State Reports give space and emphasis to child-study. In the Maine Report for 1895 Superintendent Stetson recounts the work in child-study by the summer

schools for teachers provided for by the State legislature, and publishes a valuable study of the rural schools of Maine, giving details as to school furnishings, attempts at ornamenting the rooms, characteristics of the teachers, methods in use in the different branches, and the quality of the results thus obtained. Commissioner Stockwell of Rhode Island, in his Report for 1896, recognizes the vigorous and promising work done by the Barnard Club School of Pedagogy in furtherance of systematic child-study. In Connecticut Secretary Hine is doing a unique and exceedingly important piece of work in the detailed report of the condition of the schools in different counties of the State. Fairfield County was reported last year and Tolland County this year. The work would perhaps ordinarily not be classed as child-study, but it contains nevertheless exceptionally valuable material for our subject, and might be described as a statistical study of the influence of certain methods and school conditions on children. Studies of children's reading, work in arithmetic, memory tests, tests in arithmetic and English, and much suggestive material on school hygiene are contained in these valuable reports. Somewhat similar are Superintendent Greenwood's *verbatim* reports on arithmetic and language, reprinted in Commissioner Harris's Report for 1893–94. These reproduce actual school lessons and thus furnish a practical basis for studying methods.

Outside of New England perhaps New York is foremost in official recognition of the importance of child-study, but Iowa, Michigan, and Illinois are not far behind. In New York it is a regular department of the State university, under a special State Director. While Dr. Thurber was director he instituted a fruitful and important study of "children's hopes," which is published in Superintendent Skinner's Report for 1896, together with blanks and suggestions for other topics in child-study. The advantages of the New York plan are similar to those secured by Professor Barnes in California in that only a few definite points are asked for, these questions are officially distributed, and the material

collected all at once on a wholesale scale under the superintendent's direction from a great number of schools. This sort of co-operation in the collection of material by schoolteachers and school officials, acting on the suggestions of educational experts, is one of the best and happiest combinations of skill with opportunity.

In Illinois the State Society for Child-study is heartily indorsed by the State superintendent, who co-operates with it in official recognition and propaganda. The superintendent of Cook County is one of the Vice Presidents and Colonel Parker is at the head of the society, with Dr. Van Liew as the energetic and enterprising secretary and treasurer. The *Transactions* of the society contain much valuable material and the association, while particularly noted for its enthusiastic organization and its rousing child-study convention of last spring, appears now to be about to settle down to actual work with children.

In Iowa Superintendent Sabin has given his official and hearty approval to the work of the Iowa Society for Child-study. The Department of Public Instruction last year issued suggestions for a study of eye-mindedness and ear-mindedness, weight and height records, individual characterization of school children, and a study of temperament in education. Superintendent Kratz of Sioux City is one of the leaders in the work, and in his Report for 1895--96 he devotes seven or eight pages to the child-study work he has undertaken in sight and hearing tests, in an inquiry into pupils' preferences in school studies, into the causes of poor spelling, etc. He has lectured to his teachers during the year on these and other topics and has contributed a very suggestive little piece of work to the *Pedagogical seminary* on "The characteristics of the best teachers as recognized by children."

The Michigan Department of Public Instruction has just issued its *Manual of child-study*, containing an introduction by the State superintendent and outlines, articles, and suggestions by Superintendent Whitney of East Saginaw,

agement of children to secure frankness and cordial relations with the teachers. It is, indeed, refreshing reading.

These are some of the lines of work that superintendents have already found practicable and valuable in their results. It is not so much expert training in psychological laboratories or elsewhere that teachers and superintendents need, but their most pressing need is rather to overcome the all too common adult self-conceit that presumes to know what the children should be before it knows what they really are. The study of children increases our love and appreciation of them, which, in turn, will develop our ability to study them profitably. One of the city superintendents in New England, writing to me a few weeks ago, said that the reason why teachers did not more generally take up work in child-study is that they are so often not in sympathy with children and are therefore unable to appreciate the significance of child-activity. This is the reason why they cannot interpret the meaning of their data when the observations have been collected. If the superintendents and teachers are not in sympathy with the children, I pity the condition of those children. Nothing that a teacher could do in the way of professional preparation is more necessary than to get into sympathy with children, to be able to understand them and appreciate the significance of their activities. No one who is unable to study children is fit to teach them or to superintend the teaching of them.

In conclusion, then, the work feasible and desirable for superintendents, as such, to undertake may be grouped as follows:

(1) Health—Eye and ear tests; tests of motor-ability and nervousness; stuttering; recess, fatigue, length of recitation period; health records (*e.g.*, French system); growth records; precocity and disease as related to growth; school hygiene, furniture, seating, postures, etc.

(2) Sense-perceptions—We must study the concrete contents of the minds of our pupils, not only on entering school but at every stage of their progress. When I was teaching

biology to first-year pupils in the high school, I found it just as necessary to inquire what their range of sense-perception was and what could be depended upon to arise in their minds when the words snail, scale, heart, muscle, etc., were used, as it is confessedly necessary with six-year-old children on first entering school. It is a good sign that superintendents and school boards are beginning to recognize now, in a greater degree than ever before, that they must supply things, as well as books, for teaching purposes. Laboratories, school museums, scientific collections, charts, maps, pictures, lantern slides, illustrative apparatus of all kinds, and in all subjects, need to be provided or made accessible by visits to public museums, art galleries, industrial establishments, historic spots and monuments, and the open fields and woods. School excursions for these purposes should be made during school hours and recognized as part of the regular school work instead of being relegated to voluntary Saturday afternoon trips. All the efforts made toward beautifying schoolrooms and school grounds are in the right direction and exert a powerful though silent influence in the development of good and wholesome ideas. To test the influence of these surroundings on the pupils, the concrete contents of the minds of the pupils should be inventoried in every grade at least once a year. This may profitably take the place of some of the examination tests now made on the word-memory alone.

(3) Pedagogical biographies and special reports—Just as the physician, who in his practice comes across an interesting and important case, writes it up and sends it to a medical journal, and just as the cases decided in our law courts are all recorded and reported in law books for reference in the study of the law, so also should pedagogical cases be written up and reported in the pedagogical journals. The superintendent has exceptional facilities for directing such work; for, under his supervision, a pupil may be followed from grade to grade through his course, and his record may be made continuous and complete, notwithstanding the fact that he

passes from one teacher to another. Such records should include samples of school work done at regular intervals in all the subjects, and should detail the physical and mental peculiarities of the pupil. Special occurrences of importance in the daily school work, cases of discipline, notes on play habits, all instances furnishing insight into the pupil's mental habits and traits of character, together with the measures taken by the teacher and others in their treatment of the case, and, finally, the results of the whole development in the later life of the boy or girl—such records, published, of course, without giving names, and with all the care and accuracy characteristic of medical and legal cases, should be printed in the teachers' journals, and would be worth more in practical usefulness than almost anything else we now have. Russell,[8] Bohannon,[9] Foley,[10] and others in this country, and Siegert,[11] Ufer,[12] Pfeifer,[13] Trüper,[14] etc., in Germany, have given us some such pedagogical biographies.

Secretary Hine and Superintendent Stetson have set the example of making special detailed reports on the school conditions in various counties, and, I think, no one who reads their graphic accounts and compares their statistics will doubt the value of such work in giving us a solid basis of facts on which to frame our plans for improvements.

(4) The organization of children's plays in the interest of education—This was the master stroke that Froebel used in solving the problem of education for smaller children. But it is much more than a mere kindergarten device, it is a pedagogical principle of application to every age of the pupil. We are just beginning to see that play is the natural way of preparing an immature organism for work in any line of activity and that it is the only natural response possible until skill has been acquired through its exercise. There

[8] "Exceptional children in school," EDUCATIONAL REVIEW, December, 1893.
[9] "Peculiar and exceptional children," *Pedogogical seminary*, iv. 1.
[10] *Two deaf girls*, Philadelphia, 1896.
[11] *Problematische Kindesnaturen*, Leipzig, 1889.
[12] *Geistesstörungen in der Schule*, Wiesbaden, 1891.
[13] In the new and valuable periodical, *Die Kinderfehler*, i. 3. (Langensalza, 1896).
[14] Ibid., i. 2.

would be no complaints of long sessions and school fatigue if there were not undue restraint and constraint exerted. In the George Junior Republic at Freeville, N. Y.,[15] the members are not calling for recesses every thirty or forty minutes. The boys of the McDonogh School, Md.,[16] learn more of economy, order, justice, *esprit de corps*, and honor, as well as of civics, law, and government than could be taught them in any set lessons from text-books in the hands of the best of schoolmasters. The sand-pile in the front yard of the Massachusetts cottage[17] furnished an education of a richer, broader kind than any school curriculum affords. The Syracuse High School Congress [18] is a better illustration of "education by doing" than is most of our schoolroom work. If the whole course in manual training were turned into a course in the making of toys and playthings, it would be much more educative and much better adapted to the different stages of children's developing skill—just as girls learn sewing, knitting, washing, ironing, etc., in the care of their dolls. Superintendent G. E. Johnson's article on "Education through games and plays," before referred to, is an attempt to arrange a regular curriculum of plays based on their educational value and selected for all the different grades. These are but the beginnings of important reforms that every superintendent can and should aid in making practicable.

(5) A genetic curriculum—The most fundamental problem in relation to the course of study is neither the choice nor cross-correlation of the subjects, but their sequence. We must get beyond the present ideal of making a symmetrical curriculum, with all the branches of learning advancing with measured tread through every grade. Each subject has a more or less pronounced "nascent period," when interest in and physical ability to learn it culminate. The periods of maximal physical growth are not

[15] *The Outlook*, October 31, 1896, and *Review of Reviews*, May, 1896.
[16] J. H. Johnson's *Rudimentary society among boys*, Baltimore, 1893.
[17] G. Stanley Hall, "The story of a sand-pile," *Scribner's*, June, 1888.
[18] W. K. Wicks in *The Independent*, August 6, 1896.

periods for severe mental discipline. The mind and the body both grow by fits and starts. For instance, is it true, as has been urged, that the drill in penmanship, for accuracy and beauty of handwriting, should come at twelve or thirteen years of age; that it should be concentrated into a year or two; that language can be learned best through the ear before the eighth year, and through the eye best between eight and fourteen; that severe discipline in logical analysis comes best just after puberty; that "drawing must be learned before the ninth year or not at all," etc.? These are definite questions for superintendents to study and test. They cannot be settled by *a priori* arguments.

Secondly, the methods of teaching must be fitted to child-growth, instead of, as is now so largely the case, to adult logic. Rudiments are scarcely ever the same as first principles. The logical order of proof and demonstration is seldom the psychological order of presentation requisite for the first understanding of a subject. Superintendents should be able to test and adapt ideas on these matters, and then report their experiences in school journals.

(6) All superintendents should recognize it as a duty, and a necessary part of the work of the schools, to co-operate with educational workers, wherever practicable, in gathering material on child-study.

(7) An experiment school, where new ideas on all educational subjects may be tried under sympathetic and able teachers, together with a pedagogical library and a museum of child-study and educational apparatus, should be supported as an essential part of the school system of every city and State.

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A PRELIMINARY SKETCH OF THE HISTORY OF CHILD STUDY IN AMERICA.

By Sara E. Wiltse.

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The history of the present epoch-making movement toward the systematic study of children is yet to be written. Its full and adequate story can only be told by one well versed in modern psychology, anthropology, philosophy, the study of morbid mental action, animal instinct, etc. Pending such a history, it has occurred to me that I might, perhaps, fittingly mark the termination of my service as secretary of the new section of the National Educational Association for child study during the first year of its existence, by recording the main facts in the external history of this movement with which I have been actively connected in various capacities from its start in 1880. In such an article I cannot attempt a complete bibliography, and can do almost nothing in the analysis of the many papers that have been written. I am well aware, too, that it is too early to predict or to see the full scope of this movement, which was never so active as at present. Despite the ready aid of a score or two of those most prominent in the work, which I desire hereby to acknowledge at the outset, my paper must necessarily have grave defects of omission, as no one has attempted even the beginnings of such a sketch before. As, however, I hope in the future to revise and greatly enlarge this paper, I shall be grateful for any data, articles or information from any source, not only down to the close of the meeting of the National Educational Association in 1895, with which this paper terminates, but subsequently.

The literature of this subject is already quite comprehensive. Dr. F. Tracy printed over a hundred select titles in his work on the "Psychology of Childhood," a Clark University thesis, in 1893. A fuller list of nearly 250 titles, well classified, is printed in the "Handbook of the Illinois Society for Child Study," May, 1895. A bibliography of "Child Study," is now in preparation at Clark University, which will probably appear later in the Pedagogical Seminary. Dr. G. Stanley Hall, editor of the Pedagogical Seminary,

has attempted to publish in that journal digests or reports of all important literature, the greater part of several numbers of the magazine being devoted to this subject.

While the work of child study did not, perhaps, absolutely originate in this country, the foreign initiative was extremely slight. Darwin and Lazarus had indeed made their studies; Preyer had begun the publication of some of his observations before the years 1879 and 1880, when the work in this country began. In fact, child study is, in a peculiar sense, American. Not only has more been done in this country than in all the world beside, but it seems the instinct of our people to take a fresh, independent look at primal facts of human nature and at growth itself. Moreover, the readiness of not only parents, but even teachers, often so conservative, to apply every practical result in this field, is a happy illustration of some of our best national traits. Courses on child study are now given either in the regular work or in the summer sessions at Clark University, Yale, Harvard, Princeton, Pennsylvania, and elsewhere. Specialists are now studying in this country and Europe, hoping to become professors of "Paidology" when the present transforming effects of this work upon the departments that deal with the human soul shall be a little further advanced. Already, the programme of no educational meeting is complete without at least one paper on this subject, and since the reports of the Committees of Ten and Fifteen have fully opened up the programme question, it is clear that the next step in educational progress must be to shape it to the needs of individual children. Tempting as is the future, however, we must turn from prophecy and address ourselves to history.

Massachusetts. The first important study of childhood made in this country was by Professor Henry P. Bowditch, in 1879, based upon thousands of physical measurements of Boston school children between the ages of five and eighteen, and showing that for a brief period, at the age of thirteen or fourteen, American girls are taller and heavier than American boys, and that American children are heavier than those of other nationalities that had been previously measured. This classic investigation, which has been added to in various ways by its author, led to work like that of Dr. William T. Porter, in Missouri, and the minuter work of Dr. F. Boas and his pupils and assistants at Clark University, and has doubtless influenced Dr. Hartwell's work, and that of Professor Bryan and others, but on the whole represents a line less productive as yet in this country, however fundamental its importance, than that of the study of children's minds. Professor Bowditch has lately revised his work by Galton's

method of percentile grades, and has pointed out the relations between growth and disease. Dr. Hartwell's work on children's death rates, and his papers on stammering and anthropometry, are contributions of great value. The work of Dr. Franz Boas, as well as that of Dr. West, is more minute, and establishes important relations between the growth of the face, the body, head, strength of grip, etc.

Previous to 1880 practically no scientific observations of child life had been undertaken in America. There were almost no data for comparing feeble-minded and normal children on entering school, and one searched libraries in vain to find what the average child could either know or do at a given age. It was little suspected how absolutely unreliable and false to fact some of even the best biographies were in the chapters which dealt with the childhood of great men. In 1880 Dr. G. Stanley Hall undertook to determine what the average Boston child at the age of five and six might safely be supposed to know on entering public school. He selected 123 questions, based largely upon the child's relation to nature and society, as the list shows: "Has the child ever seen a cow, pig, sheep, hen, chicken, bee, beehive, frog, worm, butterfly, ant, squirrel, snail, crow, sparrow, hawk, robin, bluebird, apples on trees, peaches, cherries, pears, grapes on vine, willow tree, pine, poplar, elm, chestnut, oak, maple, growing corn, wheat, oats, beans, potatoes, strawberries, blackberries, blueberries, moss? What seed has it planted, if any? Seen a growing rose, buttercup, dandelion, clover? Does the child know the origin of milk, butter? What its stockings are made of? Where meat comes from? Has the child ever seen a hill, river, brook, the woods, a beach, an island, a pond? Does it know its right and left hand? Can it touch elbow, cheek, forehead, ankles, knee, hips, waist, ribs, throat, wrist, knuckles? Can it pick out red, green, blue, yellow? Can it strike a tone correctly, beat time correctly, repeat words correctly? Has it ever seen the moon? Its seeming diameter? Has it ever seen stars, sunrise, sunset, dew, clouds, rainbow, hail? Does it know what season it is? Does it know the numbers three, four, five? Does it know a triangle, a square, a circle? Was the child ever in bathing? Has it been to kindergarten? Can it knit, sew? How can it help at home? What does it love to do or play best? What would it most like to have? What would it like most to be? Name three things right to do. Has the child ever owned a hoop, doll, kite, top, sled, knife, ball, jumping rope? Has it ever been in the country? How many cents has it saved at home? Has it ever seen a spade, plow, hoe, file, axe, shoemaker at work, watchmaker, brick-

layer? Has it ever ridden on a sled, sleigh, horse cars, row-boat, steamboat, cart or wagon, wheelbarrow? Can it tell a little story, say a verse, a maxim or proverb?"

This investigation was carried on through the liberality of Mrs. Quincy A. Shaw of Boston, who detailed four teachers, of which the writer was one, from her kindergartens, to act as special questioners under Dr. Hall's direction. Superintendent Seaver and the teachers of the various schools readily coöperated in this study, the results of which were published in a pamphlet, entitled "The Contents of Children's Minds on Entering School." Out of this grew a large part of the movement for the study of the psychic side of human development. The child's notions of the phenomena of the heavens, and a great majority of the topics studied of late years, were begun in this comprehensive investigation. The little book has had a large circulation in America, and has been translated into several foreign languages. Wide as was the interest this memoir excited, and far-reaching as its influence was, the full scope of the movement it inaugurated was not seen at first, and it was some years before it stimulated other investigations. Mrs. Emily Talbot issued a pamphlet with suggestions for child study at about this time, but has published no data.

In 1881 Dr. Hall printed the first comprehensive syllabus for the study of children, of thirteen pages, which was widely circulated, but produced few scientific results. "The Study of Children's Lies," published in 1882 by Dr. Hall, based upon careful observations collected by the author, has, like "The Contents of Children's Minds," been translated into several languages. The same is the case with his article on "Children's Collections." His "Story of a Sand-pile," *Scribner's*, 1887, was the last before Dr. Hall founded the *American Journal of Psychology*, in which other articles have appeared. Notes on his own children were published in his PEDAGOGICAL SEMINARY. He has also published many other articles easily accessible in the literature, and given addresses on the subject in all parts of the country. During the academic year 1894-5, Dr. Hall has printed and circulated to about 800 inquirers, in all parts of the country who had requested his guidance, a series of fifteen syllabi upon the following subjects: I. Anger. II. Dolls. III. Crying and Laughing. IV. Toys and Playthings. V. Folk Lore Among Children. VI. Early Forms of Vocal Expression. VII. The Early Sense of Self. VIII. Fears in Childhood and Youth. IX. Some Common Traits and Habits. X. Some Common Automatisms, Nerve Signs, etc. XI.

Feeling for Objects of Inanimate Nature. XII. Feeling for Objects of Animate Nature. XIII. Children's Appetites and Foods. XIV. Affection and its Opposite States in Children. XV. Moral and Religious Experiences. To these syllabi over twenty thousand returns have been made, which are now being worked up for publication.

In 1885 a systematic study of children was undertaken in the State Normal School at Worcester, at Dr. Hall's suggestion, the method of which is described by the principal, Mr. E. Harlow Russell, in PED. SEM., II. 1, and is as follows: Half sheets of note paper are furnished for the records, with heading for name and age of observer, and name or initials, age, sex and nationality of the child observed, and the length of time between making the observation and recording it. The observer is advised to conceal his purpose, to keep his note-book out of sight, and to watch the spontaneous activities of the children. It is the gathering of significant and oftentimes apparently insignificant facts that constitutes the task of the students.

Mr. Russell has collected 35,000 of these records, besides many specimens of children's drawings and 150 articles spontaneously manufactured by children. He has already arranged to publish a book on "Child Observations," which will doubtless be of inestimable value to psychologists, teachers and parents. Mr. H. W. Brown and Miss E. M. Haskell of this school have published articles on "Thoughts and Reasonings of Children" and "Imitation in Children," directly based upon the records gathered by their pupils. Mr. Bolton, a Clark University graduate in psychology, one of Mr. Russell's instructors, has done good work. The Russell method has the great advantage of spontaneity. It uses no questions and no syllabi, and greatly reduces the danger of reading into the children's minds what the interrogator seeks. It has also become a new and most stimulating way of teaching psychology, and has been entirely or partially copied in many places. Mr. Russell is one of the most stimulating of all our educational speakers, and has in late years delivered many lectures upon the aspects and results of his own work, which have exerted a wide and deep influence. His enthusiasm and example are now one of the most important educational influences in the movement. Mr. Russell's enthusiasm is, however, wisely tempered with conservatism, and this fact has made his influence all the greater with teachers.

In 1888 the writer of this sketch made a study of Hearing in the public schools of Boston. Over a thousand children were tested at Dr. Hall's suggestion, Dr. Clarence Blake, an eminent aurist, directing the practical details. A report of this was given in the *American Journal of Psychology*, and a paper

on "Sound Blindness," based upon these investigations, was read at the National Educational Association held in Nashville, Tenn., in 1889. The writer tested 113 school boys on mental imagery, notes of which were published in the *American Journal of Psychology*. From data gathered from parents, teachers and physicians, a paper on "Adolescence" was presented before the Women's Physiological Union, Boston. The writer has also questioned and made records upon thousands of children for other investigators, which have also been of the greatest service to her in the books of which she is the author, particularly in her "Place of the Story in Early Education, and Other Essays."

About 1890 the whole subject of child study in Massachusetts, not to say the whole country, received a great impulse in connection with the pedagogical department of the newly founded Clark University at Worcester. In his essay, entitled the "Moral and Religious Training of Children," in the *Princeton Review* of 1880, Dr. G. Stanley Hall first drew attention to the intimate relation subsisting between adolescence, education and religion. This subject, which has since proved so fruitful, and was greatly advanced by Dr. William H. Burnham in his most suggestive paper entitled "The Study of Adolescence," was carried still farther by A. H. Daniels in his dissertation entitled "The New Life, a Study of Regeneration," and led to Mr. Leuba's paper on the "Psychology of Conversion." All three of these gentlemen were pupils of Dr. Hall, who suggested these topics, and who strongly believes that there is a greater and still unexplored mine of psychological wisdom in this which is one of his favorite themes.

Other special studies of various phases of childhood made at Clark University are the following, which have been published or are now in press: T. K. Bolton, "Growth of Memory in School Children;" F. Tracy, "The Language of Childhood;" A. H. Yoder, "Studies of the Childhood of Great Men;" G. E. Johnson, "A Study of the Educational Value of One Thousand Classified Plays and Games;" Oscar Chrisman, "The Hearing of Children," "Children's Secret Language;" William H. Bryan, "The Development of Motor Ability;" Dr. William H. Burnham, "A Scheme of Classification for Child Study," "Individual Differences in the Imagination of Children;" Dr. A. F. Chamberlain has a large volume now in press on "The Child in Primitive Culture;" J. A. Hancock, "Preliminary Study of Motor Ability and the Relations of Strength to Flexibility in the Hand."

At Harvard University Professor Royce has collected data and published a number of preliminary reports on Imitation, which promise results of the highest value. On the other hand,

Professor Münsterberg, another Harvard psychologist, is quoted in a late number of *Intelligence* as saying in a Boston address on child study: "All that I have to say out of my deepest heart is simply I do not believe in it."

Miss Calkins, professor at Wellesley, has made a number of important inquiries, in press as I write, concerning various phases of the emotional life of children. Misses F. and M. White of Boston have collected many valuable data. Principal E. H. Russell of the Worcester Normal School has given a course of lectures on child study at the Harvard Summer School and Clark University Summer School of 1895.

In Boston, a child study session of two hours a week has been held in Miss Smith's Fröbel primary normal class. Much time has been spent on the vocabularies of children. Observations have been recorded upon the dominant interests of the children at the time of entering school, for the purpose of developing a school programme upon the basis of the child's mental hunger.

From the above we see that Massachusetts has been the pioneer state in this movement so far as effective work and productivity are concerned. Not only was she first in the field, but she has produced perhaps more valuable results than all the other states combined. So far, however, as organization goes, this state has signally failed. Three times, at least, meetings have been held and modes of organization determined upon; but while prominent educational workers have allowed their names to be used for offices, they have done nothing for the cause. As in so many other things in New England, individual initiative leads, and not organization, as is so often the case in the western and middle states. While many prominent educational men and women in eastern Massachusetts are in hearty sympathy with the movement, it is probable that the same conservative spirit which opposed Horace Mann is now expressed in the hearty applause with which the Boston Schoolmasters' Club are said to have greeted the disbelief in it expressed above by Professor Münsterberg, from his exclusively laboratory standpoint.

California. The work in California centres about two names,—Miss Millicent W. Shinn, until recently editor of the *Overland Monthly*, and Professor Earl Barnes of the Leland Stanford University. Miss Shinn's work, like that of Preyer, is largely based on the study of an individual child, her niece. She has in general also followed Preyer's methods, with important innovations and improvements, and the two large pamphlets she has so far published come up to the end of the third year. Her studies are based upon exceedingly copious and careful

notes, and are the best records of an individual child yet published in this country. They cover sensibility to light, sound, early speech, drawing, etc. What Miss Shinn herself says at the close of the second volume of her notes deserves quotation: "The most important generalization that appears to me on completing this analysis of my notes on the development of senses is one contrary to accepted opinion and to my own expectation in beginning the observations, but in accord with my general impression as they proceeded, viz., that the higher senses led from the first in the child's psychological activity. So far from finding an early dominance of taste and smell, displaced later by that of the senses that supply more mental interest, I found a lively attention to sight-impressions very early, slowly overtaken by attention to other sensations in direct rather than in inverse order of their intellectual importance."

Besides these Miss Shinn has published a number of interesting articles on various aspects of child study, and has other significant work well under way. She calls special attention to the fact that the years from three to six, about which least is known, are just those devoted to the kindergarten, and is inclined to reproach its representatives with a sense of satisfaction incompatible with serious investigation.

Miss Shinn has also written a number of minor articles upon the subject, which are very full of interest and suggestion, especially "The Visible World of a Little Child," in the March number of the *University of California Magazine*; "Comments on Babies;" "The First Two Years of a Child" (in press); "Early Home Environment," and has contributed one article to an interesting California book now in print, entitled "Primitive Drawings by Babies."

Professor Barnes has followed to some extent the methods of Dr. Hall, but has worked with more special problems and with larger numbers of children. His work marks important advances, and data for much of it has been collected under his direction by school superintendents, principals and others. One of his most interesting papers is on "The Theological Life of California Children," and brings out clearly the fact that before the age of thirteen most children are inquirers if not sceptics. His paper on "Children's Drawings" suggests important reconstructions of our methods of school drawing, some of which are now being made. Spontaneous drawings are used as a basis of observing the subjective activity of children. Perhaps even more important yet are the conclusions of another of Professor Barnes' papers, showing that the natural child first asks concerning a new object, not what are the details of its form or

its properties, but its uses, or what it is for. This should be radically considered by those disciples of Herbart or Comenius who exhaust observations and object lessons first and make application or use last. A carefully prepared and simple story was told to a thousand children, in another investigation, who drew pictures illustrating it. From these drawings, among other important conclusions, is the following: "The humane instinct in children is far stronger than the destructive instinct." He has also used the story method in the study of "Children's Rights as Seen by Themselves," has written on "Children's Plays," on "Childish Superstitions," "Class Punishments," "Comparison and Inference," "Punishment for Weak Time Sense," "Punishments in School or at Home," "Children's Sense of Time and Their Financial Sense." His organization of teachers' classes under the direction of boards of education has done effective work in San Francisco, San José, Oakland, Stockton, Alameda, Santa Cruz, Santa Rosa, and he is in constant receipt of data from these and other sources. No one has been so successful in getting large masses of data on restricted and carefully defined but important topics, and in securing the active coöperation of school superintendents and school boards. This is at least partly due to the practical nature of his work. Those who desire to know what child study has done that the teachers can make use of in the school room will find nothing in this country so immediately helpful as Professor Barnes' work. The Oakland School Report, especially that for 1892–3, shows that teachers are alive to things in this work that bear even remotely upon the physical and mental welfare of the pupils in the public school, and are aware that it is only by direct study of the children that these conditions can be understood.

During the last four years Professor Barnes has lectured in every city and nearly every village in California. His plan is to outline a subject in a general public lecture, and distribute syllabi. During the next few days the teachers collect papers, work out their conclusions, and send the papers to the superintendent's office, thence to him. He and his students work over this material, meet the teachers again and discuss results. Many of his papers are now out of print. In 1891 he started an experimental kindergarten, adding later a primary school. This opens a field for the special studies printed in the *Pacific Journal of Education* and elsewhere.

One public school in Oakland, with grammar, primary and kindergarten grades, is set aside as an experimental school for the university, and observations there are constantly re-

corded. There are regular conferences between the kindergarten teachers in San Francisco and the pedagogical department of the University of California.

Miss Schallenberger has done exceedingly interesting work in a "Study of Children's Rights as Seen by Themselves." Mrs. Lulu Medbury Chapman, Mrs. Katherine Wolsey Slack, Mrs. Eleanor Gibbons Sharp, Mrs. Walker, Mrs. Condy, Mrs. Frances Bracken Gould and Miss Mirriam B. Levy have done valuable work. Miss Holmes, working under the direction of Professor Frank Angell, has studied the fatigue of a school hour by methods that give different and more reliable results than those of Burgerstein.

Alexander E. Frye, superintendent of schools, San Bernardino, California, has published for the use of his teachers a number of mind charts, by the aid of which the child may be judged as to temperament, constitution and sense defects upon entering kindergarten, and from thence through his school life. Several of Dr. Hall's pupils are doing good work in child study in California. Among these are Principal Yoder of the San Francisco Normal School, Dr. Dresslar at Los Angeles and Professor Bailey of the State University. Mr. Luckey, now of Clark University, published a year ago, from the laboratory of the Leland Stanford University, a most admirable study of color perception in the peripheral retinæ of children, showing it to be far more restricted relatively than in adults.

Altogether, California undoubtedly ranks next to Massachusetts in the amount and value of research in this field. School and university coöperate cordially and effectively in the work, and what has already been accomplished, important as it is, seems likely to be greatly surpassed by what may yet be reasonably expected. A new university, earnest and able young men and women and a young country seem a fit medium for large achievements in the future. Organization has been always directed to practical results, and here California surely leads. The genius of Miss Shinn and Professor Barnes has already accomplished results that are simply marvelous, and of which this little sketch, written at so great a distance, is very inadequate.

Illinois. The movement for the study of children in Illinois sprung from a variety of influences. Among these are the sympathetic educational spirit and love of childhood of Col. F. W. Parker, head of the Cook County Normal School, who is a born lover of children; the remarkable two days' session of the Child Study Section of the National Educational Association, held in Chicago in 1893, under the presidency of G. Stanley Hall, and his lectures given the same year in

Springfield and Chicago; and the work of several of his pupils in that city and in the state, of which perhaps Dr. Krohn has been most active; the work of Superintendent O. T. Bright in the organization and the constitution of the State Society for Child Study, incorporated under the laws of the state of Illinois and indorsed by the state superintendent, is a model of what such an organization should be for effective work. The energy and sagacity of the secretary, Mr. C. C. Van Liew, are shown in the published "Transactions and Handbook of the Society," and in the fact that the latter is self-supporting, with 500 members. Dr. Krohn's courage and enthusiasm are manifest in the *Child Study Monthly*, a journal of sixty-four pages, begun in May, 1895. Prominent among the features of organization are the local child study round tables in all parts of the state, chartered by the society and reporting to it, of which half a dozen are now at work; the scheme for visitations of schools and kindergartens and the Advisory Board of professors and other experts, of which Dr. Adolph Meyer is one of the more active members. Professor Bryan has actively coöperated in the work of the society. Among the more important articles in the "Transactions" are "Child Study as Related to Instruction," by C. C. Van Liew; Dr. Holmes, "Measurement of Factory Children;" Dr. Meyers, "Mental Abnormalities;" Dr. H. H. Donalson, "Growth in Relation to Training." The society has also printed many syllabi for the study of children, so that on the whole its publications are invaluable for every worker in the field. All the work of this society bears out the terse sentence of President Parker in his address: "The Illinois Society for Child Study proposes honestly and earnestly to investigate the nature and growth of the child and the best conditions for his growth and education." Professor Krohn, chairman of the Executive Committee, has published a text-book entitled "Practical Lessons in Psychology," based largely upon the study of children, and has measured the Indian and colored children at Hampton Institute.

Prominent among the features of the organized work in this state is the development of relations with physicians and the enlistment of parents in the work. One of the best points about the work is that both the kindergartners and the Herbartians, who in most parts of the country have held aloof from the work, have in Illinois cordially coöperated. Dr. C. A. McMurray, one of the most active and influential Herbartians in the country, has accepted a position as a member of the Executive Committee, and Dr. C. C. Van Liew has also seen that both these causes are

in child study, and at present is publishing studies upon sex differences. Superintendent H. E. Kratz of Sioux City has tested children's senses, their moral sense, etc. In December, 1894, the Iowa Society for Child Study was founded with the approval of the State Superintendent, Henry Sabin, with about sixty members, which has outlined three directions of work: 1st, For Testing Eye and Ear-Mindedness; 2d, For Determining Height and Weight in Children; 3d, For the Study of Temperament Education. Mr. E. H. Kirkpatrick, a former student of Clark University, has studied the development of language in children, and their imagination. He has also published a paper on "Memory" in the *Psychological Review*, Vol. I, No. 6.

Pennsylvania. Dr. Lightner Witmer gives a course of lectures, the professed aim of which is to open to the beginner the field of experimental psychology directed to the study of children. Sydney T. Skidmore, A. M., prepared a valuable paper on "An Evolution of Play," which he read before the Educational Club of Philadelphia two years ago. His practical suggestions ought to have borne some fruit by this time. Dr. John Madison Taylor had preceded him with a paper on the "Insane Disorders of Childhood," read before the Pan-American Congress, and another on "Spontaneous Effort in Childhood and Youth." These papers are alive with practical thoughts concerning the environment of the city child and the possible relation of the suppressed play instinct to disease and crime. Samuel D. Risley has examined children both in public and in private schools, to detect symptoms of disordered vision. He finds children sometimes accounted mentally defective who are only afflicted with imperfect eyesight. His opinions and conclusions are of grave importance, and are admirably set forth in the *Educational Review*, Vol III, No. 1. Miss Constance MacKenzie, superintendent of the Philadelphia kindergartens, has studied children's drawings with reference to their tendency to draw large, small or normal, and read a paper on the subject before the Philadelphia Psychological Club. Miss Mary S. Marot is doing valuable work. Miss Boyce, who has studied with Dr. Warner, makes constant application of his methods of discovering fatigue signs and tracing them to the right cause. Too much cannot be said of the value of this knowledge of symptoms, which saves many a child from misapprehension and injury.

New Jersey. Professor J. M. Baldwin has embodied the interesting observations he has made upon his own children in a volume entitled "Mental Development in the Child and the Race." This volume is most interesting and valuable

where experiments are recorded, but the speculative part of the book will strike many as over-subtle and its conclusions premature. Dr. Baldwin has a strong sense of the importance of the subject, and, like Professor Royce, assigns to imitation a preponderating rôle in psychic evolution. The *Psychological Review*, of which Dr. Baldwin is one of the editors, has printed valuable contributions. He promises another volume entitled "Interpretations."

Miss Lillie A. Williams of the Trenton Normal School has collected data of the greatest value, exceeded, perhaps, in quantity as well as worth, only by that of Mr. Russell. During the past year Miss Williams has followed Dr. Hall's fifteen syllabi and contributed hundreds of records to each one. Her method has been to dictate each syllabus to her normal classes, talk over the phenomena, and then each member goes with her observation books and blanks to all children and adults within reach and the results are forwarded. Toward the end of the year each pupil attempts some classification of her recorded results as part of the work in the psychology class. Tests and experiments are also made on children in the belief that those who do this work are better teachers.

Connecticut. Dr. E. W. Scripture, head of the Yale psycho-physical laboratory, a former pupil of Dr. Hall's, has lectured to teachers on child study in California, Maine and Massachusetts as well as in Connecticut, and has contributed a number of articles, and stimulated work in others. His pupil, J. A. Gilbert, has tested the musical sensitiveness of school children, and has investigated mental and physical development in the studies from the Yale psychological laboratory. Miss Carlyle of the Normal School at Norwich and Miss Hattie E. Hunt of Hartford have collected data.

Michigan. A deep and growing interest has been manifest throughout the various parts of Michigan during the past year, since Dr. Hall's lecture, though as yet no very definite and systematic study has been undertaken outside of Saginaw, E. S., Lansing and Cadillac. In these cities Dr. Hall's syllabi have been printed and furnished the teachers of the schools, meetings for study, consultation and comparison of reports have been held, and much good work accomplished. In Saginaw, E. S., a very prosperous mothers' club has been formed. This special movement was given a general impetus at the last meeting of the State Teachers' Association, held at Lansing, November 26, 27 and 28. At this gathering a child study section was added to the general programme by the unanimous vote of all the members of the association. The movement bids fair to permeate and arouse every school in the state the coming year, through the efforts of State Superintendent Pattingill, who is deeply

versity, was the chairman. Dr. Bailey's syllabus is one of the best and most comprehensive that has yet been published. Mrs. Schleppergrell-Keppler has been a very active worker, especially in the kindergarten grades.

Colorado. Mr. J. A. Hancock, superintendent of schools in Durango, has studied children's drawings to discover what they best like to draw. Eighty-seven per cent. of 300 children observed, asked to draw animals. Mr. Hancock thinks it evident that the movement of animals attracts them first, their use becoming of interest to the child somewhat later.

Ohio. Dr. Aikins, a Clark University man, is making investigations in the line of child study, and has directed the studies of his pupils in investigating the moral ideas of children.

Dr. Dowling has made an exhaustive study of the eyesight of children in both public and private schools, having examined more than 1,000 children for this purpose.

Rhode Island. In the training school for teachers, Pawtucket, R. I., of which Miss Mary L. P. Shattuck is principal, initial steps in the observation of pupils in all grades have been begun. The same work is done in the kindergarten training school in Providence.

Nebraska. Professor H. K. Wolfe of the State University published, in 1890, an investigation on the "Color Vocabulary of Children," based upon 23,000 returns, which shows, besides many other things, how very accidental is the association of names with the color perception, and how often the color blind learn to associate names with well saturated typical colors. His tabulation of errors suggests a new standard here. Professor Wolfe has for the last four or five years made other records and observations, and has an unusual accumulation of results which remain as yet unpublished. As the best illustration of a unique collegiate method of bringing out the educational value of child study work and methods, I cannot do better than to insert the following extract from a letter by Prof. Wolfe of the University of Nebraska:

> At the University of Nebraska two courses in child study are given each year. The work is systematic, and, even in the introductory course, is planned for students of senior rank. The first course is given only during the second semester. The class meets for informal lecture twice a week. About half the members have had three half years' work in physiological, experimental and comparative psychology. Other members may have had but one semester's work in psychology. These latter must be especially interested in this kind of work, and must carry their second semester's work in psychology along with child study. Last year this introductory class numbered twenty-five members. The students average fully three hours' preparation for each lecture. Rather full notes of points, facts, etc., with page references for reading, are furnished in advance of the lecture. These notes

(mimeographed—not dictated) average perhaps 300 words per lesson. Of course the work is based on the previous study of psychology. It is a study of the *facts* of individual development from conception to the age of six years, supplemented by the consideration of a few monographs on later phases of growth and life. No original work is attempted in this introductory course, but each student is required to spend considerable time in the primary schools of the city, and to report in detail on the physical characteristics of at least ten children. For this report blank forms containing about thirty points are furnished. Students are also required to test many of the facts stated, especially in regard to development and training of the senses in younger children, and to criticise methods observed in the city schools as well as to suggest methods for specific purposes. No attempt is made to construct a body of rules for the wholesale reformation of prevalent methods. I think the general effect is to *increase* the individuality of the teacher.

It is interesting to know that some young men and several young women have taken this course without any intention of becoming teachers. Its culture value has been recognized, but far more significant is the fact that young men and young women in a co-educational institution are able to perceive the importance of such study for all parents.

The second course runs through the whole year. The class meets once a week, for two hours. Ten students who had completed the work of the introductory course were enrolled last year. Some of these students have had three years' work in child study, and are among the best teachers in the Lincoln schools. The purpose of this course is twofold. First, each student is expected to obtain during the year some rather definite information concerning the entire literature of child study. Titles are classified and furnished the students by the instructor. All works in English are examined by each student, and notes regarding scope and importance are made. The more important works are read and digests are made. Contents of the best works in other languages are summarized by the instructor and noted by the student. At the close of the year each student should know something of what has been done in child study, and should have a descriptive bibliography, made by himself, that will enable him to continue the work without an instructor. The making of such a bibliography is worth the time spent, and its possession is, at least, equally valuable.

In the second place, each student selects two topics for special investigation and to report upon. The first one requires very little experimental work. It is chiefly the careful study of some important monograph or group of articles on one subject, with such supplementary work from her own school-room, or from our laboratory, as the student has time to perform. These reports each occupy from one to two meetings. The second topic of the year is assigned for original work. While the gain to science has not been as great as we hope it will be in future years, the advantage to the student cannot be overestimated. The most successful investigations of last year are now being put in form. They include a study of the elements of stories that especially interest children: the color sense of children from four to eight years old; spelling by eye and ear methods of study; the drawing of straight lines by children before they have learned to write; mirror writing. I must add, however, that all our results are much more valuable to us who do the work than to science. The first and last object of our course is to help the teacher who takes the work by enabling her better

to adjust herself to the requirements of the child's world. An experience of five years with child study, in a co-educational state university, convinces me that such work is not only possible, but will yield better results both for culture and for "practical" life than almost any other one subject. I am also persuaded that, to be successful, this work must be both systematic and philosophical.

Mr. Luckey, who assumes the chair of pedagogy in that university in October, has studied laughing and crying with the phonograph at Clark University, and will no doubt help the work along in this state.

In Minnesota Mr. M. V. O'Shea's "Suggestions for the Observation and Study of Children," and J. H. James' "Suggestions Regarding Visual Defects of School Children," remain up to date the only contributions to the work in this state known to the writer.

In Maryland the same is true of J. Johnson's "Rudimentary Society Among Boys," which is perhaps the best of all studies yet published of the social instincts of children.

In Ontario, Canada, the child study movement may be said to have received its first definite impulse from a series of addresses delivered last year by Dr. G. Stanley Hall, at the annual meeting of the Ontario Educational Association, held in Toronto. In April and May, 1892, Dr. A. F. Chamberlain of Clark University superintended the extensive measurements carried on in the public schools of the city of Toronto, with the approval of the authorities and the coöperation of the teachers, under the auspices of the sub-department of Physical Anthropology (World's Columbian Exposition), Chicago, the chief of which was Dr. Franz Boas, then docent in anthropology at Clark University. The results will appear in the report of Dr. Boas, to be published at a future date. This year the Dominion and Ontario Associations held a joint meeting at the same place. Papers on child study were read by Dr. Tracy of the University of Toronto, and S. B. Sinclair, M. A., of Ottawa Normal School. The discussions developed the fact that there was an increasing interest in the subject and that considerable work had been done. This interest took definite shape in the formation of a child study section as an organic part of the Ontario Association. Dr. Tracy was appointed chairman, and Miss MacIntyre, kindergarten supervisor of Toronto Normal School, secretary. The committee has mapped out a course of study for the ensuing year.

Among the earliest students of child life we find the members of the Women's Anthropological Society of Washington. In 1886 Mrs. Clara Bliss Hinds read a paper before this society on "Child Growth," to which were appended twenty-

three questions for mothers to answer. The same student issued a set of questions in 1891, for the study of Afro-American child life. Mrs. Annie Howes Barus has contributed several papers to the society, based upon the observation of her own children, one, "The History of a Child's Passion (for Bottles)," being of uncommon interest. The Association of the Collegiate Alumnæ has undertaken the study of children, sending out a circular of directions with four schedules. The first schedule directs the student in observations of babies under six months old; the second is intended for observations of the child under a year old. There are at the present time four schedules, the last involving studies of memory, imagination and speech. This association recommends students to prepare themselves by a careful study of Preyer's "Mind of the Child," Shinn's "Notes on the Development of a Child," and Tracy's "Psychology of Childhood." In 1891 Mrs. Annie Howes Barus read a paper on "The Study of the Development of Children" before the association, which contains acute observations upon early infant life. Miss Shinn has printed several of her best papers in connection with her work as a member of the Collegiate Alumnæ. It seems to the writer that this is the place where the best work should be done. The sympathy and the tact of educated women ought to produce the best possible results. How much serious work they can really do remains yet to be seen. It is possible that this association made an initial error in placing this department under the direction of foreign experts, when home talent was to be had for the asking, that was quite as good and better from proximity and readiness to work. Besides all the above work, much of which is, of course, only beginnings, and very rudimentary at that, there are many tentatives and syllabi. It is already abundantly shown that any teacher or parent of common education and intelligence can record facts of which the psychologist can make great use, just as any traveler or missionary can record observations on the savage life for the anthropologist, or hunters, trappers and light-house keepers can fill out blanks on migratory and other instincts of animals for the comparative psychologist. It must not be forgotten that although it is necessary to look for scientific results, to which alone we have had an eye in the above sketch, the greatest value of this work consists in putting the teacher into rapport with the individual pupil. To change from the machine method of handling masses of children to this standpoint, gives new life to teaching. It is especially the women's way in the school-room. For every incident or fact, however small, that has the least scientific

value, it is probable that scores, and perhaps hundreds, of pupils and teachers are benefited by coming into a new relation. Those who send out syllabi to large numbers of people always hear from many who are benefited by them who do not even try to make a record. The more we know about child study, the truer becomes the well worn saying that it is first for the teacher, second for the pupil, and last and incidentally for science. It must not be forgotten that to secure the first two benefits in full measure, the last must chiefly be held in view. We have yet to hear of any intelligent man or woman, who has given the subject careful attention, who is not heartily in favor of it.

At the National Educational Association, which met in Denver in July, the Child Study Department listened to reports of the movement in various states. Papers on the different phases of work were read by the Dr. Bryan, president, Mr. G. W. T. Patrick, Mr. Krohn, Mr. Kratz, Dr. Shaw, and others. Mr. O'Shea gave an address on "The Method and Scope of Child Study for Teachers," and Mr. Barnes spoke on "Punishment as Seen by Children," showing that 42% of 4,000 children consider their punishment just, 12% think the punishment does them good in some unknown way, 7% accept what comes from the authorities without question, 4% claim to be innocent, 10% object to their trial, and only 11% are willing to say that they are right and those who punish them are wrong. Mr. Brown of the California University contributed something upon "Children's Interests in Reading," which had a most practical bearing. Mr. Van Liew reported upon his experiments in giving rhymes, myths and stories to children as a preparation for reading the same. Mr. Hancock presented some of the results of his Motor Studies, which bear directly upon mistakes in the kindergarten, and in teaching writing, too, early in primary school, and Drs. Hartwell and Lincoln spoke upon School Hygiene, which bears so directly upon mental conditions of pupils.

A series of brief and brilliant addresses was given on "What Can the Public School Teacher Profitably Undertake in Child Study?" All meetings of the department were well attended, and an astonishing amount of work reported as being done throughout the country.

The most common objections to child study are made by older and more conservative teachers, and by teachers of philosophy of the old type. It is sometimes said the study of children makes them self-conscious. Professor Munsterberg says he loves his children, but congratulates himself that he never did and never will study them. But child study is not vivisection, and if any of its cruder methods have in any

case tended to make a child self-conscious, such methods are invalidated. It is the spontaneity of the children that is wanted, and the natural acts, words and thoughts of the child that are of real value. Much of the observation has no more tendency to spoil children in this way than Mr. Z. Clark's attempt to note down the morning song of the robin would tend to make that bird affected. A teacher with tact will even question and cross-examine children, not only with no danger of making them affected or introspective, but with the very greatest benefit to the child's own psychic activity. For instance, by exploring childish fears, the act of telling them by the child tends to somewhat diminish them, as confession is good for the conscience, while the sympathetic questioner shows the child that its fears are not peculiar to itself, and is often able to remove a definite cause of fear as well as to adopt lines of treatment for the gradual reduction of others. To lessen these secret fears, which in some cases that I have known make life miserable and greatly limit the sphere of activity, is sometimes one of the greatest services that one person can perform for another. If teaching is to remove ignorance, superstition and error, its highest joy and use are incalculably increased by knowledge of the child soul, such as only special study can give. To those who think in dollars and cents, I will add that this knowledge greatly enhances the pecuniary value of the service which teachers render in developing soul power.

To those who say child study is a fad, the answer is no less ready and overwhelming. There are many crudities of method and trivialities in the way of results. Many people are attempting kinds of work in its various fields for which they are totally incompetent. Only those trained, as I have said, in the study of insanity, anthropology, philosophy and laboratory psychology, etc., and who can wield all the resources of these great departments, are fully trained for this work, but every one can help not only himself, but the expert. The dimensions and force of this movement are shown by the fact that, like other great culture movements, it has overflowed the traditional channels of academic work, and has become a popular movement, which, like the Reformation that it consummates, has as its watchword *Individuality*. Few have yet seen the vast scope of the movement. One of its best features is that it is a new point of contact between the people and scholars, and is bringing together the university and kindergarten as never before in their history. Every great movement floats many faddists and dilettantes.

The professors who look askance upon child study are of two kinds: those whose work has shut them within the four

walls of a psycho-physical laboratory, and the teachers of the old fashioned philosophy. The former are certain to favor the movement, as many of them are doing as soon as they see the full scope of its meaning; the latter will go very slowly. Those with ethical bias are beginning to study the social instinct of children; those who teach Kant, and still more those who, like many normal school philosophers, live in a realm of dry definitions, will probably be the very last to be reconciled to this movement.

Finally, as a kindergartner and as a woman, I must say two last words.

As a kindergartner I feel keenly the criticisms of our methods suggested by Mr. Hancock's scientific objections against the finer work, by Van Liew's criticism of our philosophy, and by Miss Shinn's suggestion that we say of child study as those who burned the Alexandrian Library said of its agreement with the Koran: "If child study agrees with Fröbel, it is of no use, so burn it; if it does not, it deserves only to be burned." I think there is less truth in Miss Shinn's statement that it is just the kindergarten years from three to six of which we know least. For one I am quite convinced that the time has come when we must modify some of our most established practices, and that if Fröbel came to Boston, he would be found among the foremost students of childhood, and would coöperate eagerly in such revision of his work as child study suggests, and those who love his spirit more than his letter had long ago begun.

As a woman I desire to see the vast affectional resources of the woman's heart brought out in every school-room. What most children need in their earlier years even more than knowledge, is love, and to establish this individual bond which the man-made machine method had almost forgotten, the best and only method is more individual knowledge of each child. The study of a child, even mentally or morally defective, throws a charm of interest about it and vastly increases the chances of doing that child good. To know children is to love them, and not only the American school with its growing proportion of female teachers, but the American home with its decreasing children and lessening home ties, and American girldom generally, with its fading ideals of domesticity, can only be affected favorably by anything that tends to draw it toward the highest object of human affection, the object most worthy of reverence, love and sacrifice,—the growing child.

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PSYCHOLOGICAL STUDIES,

DIRECTED BY

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WELLESLEY COLLEGE PSYCHOLOGICAL STUDIES.

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I.

A. THE EMOTIONAL LIFE OF CHILDREN.

The attempt is here made to compare the emotional life of children not yet in school, with that of those who have spent about six years in the public schools. Of course the investigation touches only on prominent features of the complex emotional nature, and lays no claim to completeness. Yet its results suggest some important distinctions, and, in particular, lay fresh emphasis on the effect of training upon imagination and feeling. The inquiry has been conducted by means of a series of questions,[1] answered, in the case of the younger children, by the mothers, but by the older children for themselves. The children are chiefly from families of Pennsylvania German ancestry. The first group contains 75, and in the answers given some allowance must, of course, be made for the unconscious coloring given by the mothers to their reports. The second group includes 127 children from the secondary schools, whose ages vary from nine years, six months to fifteen years, seven months, with an average age of twelve years, one month. The older children belong, for the most part, to what are called the working classes, and differ somewhat, in environment, from the first group. The prevalence of fear among these children, and its dependence on age and sex, are shown in the following tables:—

TABLE I.

Prevalence of Fear. *a.* (Different Ages.)

Children have	UNDER SCHOOL AGE.						School Age. Average 12.		Total Cases.	
	Under 3.		Between 3-6.		Total.					
No Fear	9	39%	6	11.5%	15	20%	1	.8%	16	7.9%
Fear	14	61%	46	88.5%	60	80%	126	99.2%	186	92.1%
Total	23		52		75		127		202	

[1]For list of questions cf. page 330.

b. (Boys and Girls.)

Children have	Under School Age.						School Age.						Total Cases
	Boys.		Girls.		Total.		Boys.		Girls.		Total.		
No Fear	8	17.4%	7	24.2%	15	20%	1	1.7%			1	.8%	16
Fear	38	82.6%	22	75.8%	60	80%	57	98.3%	69	100%	126	99.2%	186
Total	46		29		75		58		69		127		202

The noticeable feature of these summaries is the increase of fear with added years. Two-fifths of the children under three years and one-tenth of the children under six, but less than one-hundredth of the older children, are reported as having no fear. The supposed prominence of fear among girls is certainly not shown by the younger children, since a larger per cent. of girls than of boys, under six, are said to be fearless.

The mothers of the younger children were asked to classify the fears according to their sense-type. The results suggest that the prominence of sound-fear which has been noticed[1] is among very young babies, not among the next older children. The figures are these:—

Table II.

Sense Types of Fear. (Children under 6.)

Ages.	Fear is of						Totals.
	Sights.		Sounds.		Unclassified.		
Under 3	14	66.6%	5	23.8%	2	9.5%	21
Between 3 and 6	62	61.3%	16	15.8%	23	22.7%	101
Total	76	62.3%	21	17.2%	25	20.4%	122

Note.—The figures refer not to the children, but to the numbers of their different sorts of fear. The per cents. in this, as in most of the following tables, are reckoned on the basis of the totals in the right hand vertical column.

One other inquiry, into the origin of the fears, was made in the case of the younger children only, for it was thought likely that the children who answered for themselves would have forgotten these beginnings of emotional experience. The results are these:—

[1]Cf. Tracy, "Psychology of Childhood," p. 29 (with references).

TABLE III.

Explanations of Fear. (Children under 6.)

AGES.	FEAR IS										TOTAL CASES.
	"INNATE."				"FROM ENVIRONMENT."				No Explana'n.		
	Inborn.	Inherited.	Total.		Acquired.	Taught.	Total.				
Under 3	7	1	8	38.0%	5	3	8	38.0%	5	23.8%	21
Betw. 3-6	16	8	24	23.7%	23	28	51	50.4%	26	25.7%	101
Total	23	9	32	26.2%	28	31	59	48.3%	31	25.4%	122

The numbers here refer to the different objects of fear, of which each mother was asked to name several. A greater number of fears, compared with the number of subjects, is noticed in the second group of children from three to six (122 things feared by 59 subjects, over against 21 things feared by 23 subjects). It is significant that even among the youngest children the fears actually taught the child, or acquired by him in some accidental way, are as many as those which seem to be innate, either hereditary or instinctive, while among children over three the acquired is more than twice as large as the innate class. The doubling of the fears which are explicitly imparted, is here especially prominent.

The objects of fear have been classified in the following summary:—

TABLE IV. *a.*

Objects of Fear. (Different ages.)

AGES.	People.		Ghosts.		Dark.		Wild Animals.		Common Animals.		Nature.	
Under 6	21	17.2%	3	2.5%	12	9.8%	18	14.7%	32	26.2%	5	4.0%
Average 12	9	2.4%	8	2.2%	5	1.3%	225	60.6%	51	13.7%	38	10.3%
Total	30	6.0%	11	2.2%	17	3.4%	243	49.0%	83	17.8%	43	8.7%

AGES.	Things.		Unclass.		Tot. Imag.		Total Real.		Total.
Under 6	9	7.3%	22	18.0%	34	27.1%	88	72.9%	122
Average 12	8	2.2%	27	7.3%	207	55.7%	164	44.3%	371
Total	17	3.4%	49	9.9%	241	48.8%	252	51.2%	493

The most interesting distinction here is that between real and imaginary objects. The fear of wild animals, which are known to children through stories of their cruelty or their ferocity, is one of the commonest types of imaginative fear. The influence of training is once more shown in the greater frequency of imaginary fears among the older children. The lessening of the fear of people and of things points, of course, to the widening of the experience. Interesting, also, as contradicting the ordinary view that girls are especially imaginative, while boys are usually prosaic and literal, is the slightly greater proportion of imaginary fears among the boys. The figures are these:—

TABLE IV. *b.*

Objects of Fear. (Boys and Girls.)

SEX.	Imaginary Objects.		Real Objects.	Total.
Boys	136	55.9%	107	243
Girls	136	54.4%	114	250
Total	272		221	493

From the complete lists of things feared by children of twelve, it appears that the boys show far more originality than the girls. Of 207 objects mentioned by 69 girls, there are only 38 different ones; while of 164 mentioned by the 57 boys, 48 are different. The exact figures in some prominent cases are the following:

TABLE IV. *c.*

Different Objects of Fear.

OBJECTS.	OF GIRLS. (69.)		OF BOYS. (57.)	
	Different Objects.	Total Number of Objects.	Different Objects.	Total Number of Objects.
Wild Animals	10	115	16	107
Common Animals	8	31	6	16
Nature	5	25	6	13

This difference is an important one, because it falls into line with the ordinary assertion that women, whatever their critical and reflective power, are endowed with less originality, less power of initiation than men. The real question in the case of these children, as in regard to adults, is, of course, this: Is the lack of originality

fundamental and inevitable, or is it a result of training to inactivity, of more monotonous environment, and of more narrowing occupations? Our results furnish no answer to this question, for even among these children, the training of the girls, the choice of their associates, the character of the stories which they have read, and the nature of the ideals presented to them, have differed widely from those of the boys.

II

The second subject investigated, the affection of children for people, for animals, and for "things," gives highly unsatisfactory results, in the nature of the case, since love is the most complex and evolved, as fear is perhaps the simplest and most instinctive of the emotions. The question: "Are you especially fond of any one?" was accompanied by the suggestion of "parents or playmates," and in most instances the answers merely repeat and adopt the suggestion. The reasons given are mainly acknowledgments of favors received or of affection reciprocated, as "Good to me and love me," and "Brings me peppermints." One child recognizes the influence of propinquity in the reply, "Because she lives in our house," and a few admit the inexplicable nature of love, as in this answer of a three-year-old: "Why, I wike her, that's why I wike her."

In many of the answers to the questions about animals the children show that they have mistaken a natural interest in animals for stronger feeling. All in the second group, save one who gives no answer, claim to have an especial fondness for animals, but the animals they name, as, for instance, elephant and giraffe, are in some cases those to whom they can not actually be attached. More discrimination is shown in the answers given by the mothers for the younger children, and we may perhaps conclude from them that four-fifths of all little children have a fondness for living pets.

TABLE V.

Fondness for Animals. (Children from 3 to 6.)

SEX.	Fond.		Not Fond.		No Answer.		Total.
Boys	37	80.4%	8	17.4%	1	2.1%	46
Girls	22	76.0%	7	24.0%			29
Totals	59	78.6%	15	20.0%	1	1.3%	75

The horse is by far the most popular animal with boys and girls of both ages, but the greater preference is shown by the boys. There is really very little difference between the two goups, and very little between the boys and girls of six. There is, however, a marked difference between the boys and girls of twelve. The boys show a decided preference for out-of-door animals, 39% choosing the horse and farm-yard animals, while but 28% of the girls choose the same. A corresponding difference is seen in the choice of domestic pets, 70% by the girls, 55% by boys.

In response to the question, "Of what things are you especially fond?" we have a variety of answers. Table VI shows the preliminary classification:—

TABLE VI.

Prevalence of Liking for Things. *a.* (Different Ages.)

Ages.	Number of Children who have Liking for										Total.
	Animals.		Food.		Food, Things		Things.		No Answer.		
Under 6	2	2.6%	1	1.3%	7	9.3%	47	62.6%	18	24.0%	75
12 to 14	8	6.3%	38	29.9%	25	19.6%	52	40.9%	4	3.1%	127
Total	10	4.8%	39	19.3%	32	15.8%	99	49.0%	22	10.8%	202

b. (Children of 12 to 14.)

Sex.	Number of Children who have Liking for										Total.
	Animals.		Food.		Food, Things		Things.		No Answer.		
Boys	4	6.8%	19	32.7%	8	13.8%	24	41.3%	3	5.1%	58
Girls	4	5.8%	19	27.5%	17	24.6%	28	40.5%	1	1.4%	69
Total	8	6.3%	38	29.9%	25	19.6%	52	40.9%	4	3.1%	127

Setting aside the animals, to which the preceding question referred, we gain from the full lists of things which are loved, the following summaries, which are given entire because they reflect so exactly the characteristics of the different ages and sexes. The figures refer to the number of distinct objects named.

TABLE VII.

"Things" which are Loved. *a.* (General.)

Ages.	Flowers.		Music.		Sports.		Study.		Toys.		Unclass.		Total.
Under 6	15	9.3%	13	8.0%	33	20.4%	37	23.0%	43	26.7%	20	12.4%	161
12 to 14	41	25.8%	16	10.0%	54	33.9%	23	14.4%	4	2.5%	21	13.2%	159
Total	56	17.5%	29	9.3%	87	27.1%	60	18.7%	47	14.6%	41	12.8%	320

b. (By Children Under 6.)

Sex.	Flowers.		Music.		Sports.		Study.		Toys.		Unclass.		Total.
Boys	8	8.2%	5	5.1%	21	21.6%	27	27.8%	28	29.0%	8	8.2%	97
Girls	7	10.9%	8	12.5%	12	18.7%	10	15.6%	15	23.4%	12	18.7%	64
Total	15	9.3%	13	8.0%	33	20.4%	37	23.0%	43	26.7%	20	12.4%	161

c. (By Children of 12-14.)

Sex.	Flowers.		Music.		Sports.		Study.		Toys.		Unclass.		Total.
Boys	10	13.7%	3	4.1%	35	47.9%	13	17.8%	2	2.7%	10	13.7%	73
Girls	31	36.0%	13	15.1%	19	22.0%	10	11.6%	2	2.3%	11	12.8%	86
Total	41	25.8%	16	10.0%	54	33.9%	23	14.4%	4	2.5%	21	13.2%	159

The decreasing love of study as children grow older is opposed to a common view of the interests of young children. In reality, their burning curiosity occasions a love for study none the less intense because it is not accompanied by a capacity for sustained attention. The growing interests in sports, the elimination of the liking for toys, and the increasing love for flowers are other signs of development.

The differences between boys and girls are in the same lines, though in lessened degree, among younger as compared with older children. The greater fondness of the girls for flowers and for music, and their smaller liking for sports, may be fundamental, but may also be effects of training and of custom. The interest in study among the boys, at first much greater, falls to a less important difference.

The reasons given show little self-analysis. They are very similar. Of flowers, the children say: "They are fragrant and look pretty;" of games: "It gives me pleasure," or "It is fun;" of music: "It is nice," or "I enjoy it." When the explanation is not a stereotyped one, the object chosen is commonly unusual, as in the case of the boy who likes children because he enjoys teasing them.

III.

The dislikes of these children do not seem to increase as they grow older. There is little difference between boys and girls under six, but the older girls have either fewer dislikes, or more hesitation in expressing them, than the boys. All this appears from the following table, which considers only the prevalence of dislike for people.

TABLE VIII.

Children's Dislike for People.

Children have	AGE UNDER 6.			12-14 YEARS.			Total.
	Boys.	Girls.	Total.	Boys.	Girls.	Total.	
Dislike	13 (28.3%)[1]	8 (27.5%)	21 (28.0%)	23 (39.6%)	14 (20.3%)	37 (29.1%)	58
No dislike	27 (58.6%)	19 (65.5%)	46 (61.3%)	33 (56.9%)	54 (78.2%)	87 (68.5%)	133
Doubt[2]	6 (13.0%)	2 (6.9%)	8 (10.6%)	2 (3.4%)	1 (1.5%)	3 (2.2%)	11
Total	46	29	75	58	69	127	202

The reasons given admit of classification, as those which do and those which do not imply reciprocal dislike.

TABLE IX.

Reasons for Dislike of People.

AGES.	REASONS FOR								Total.
	Recip'l dislike.		Non-reciprocal.		Unexplained.		No Reason.		
Under 6	9	42.8%	5	23.8%	3	14.3%	4	19.0%	21
12 to 14	19	51.3%	18	48.7%					37
Total	28	48.3%	23	39.6%	3	5.2%	4	6.9%	58

"Reciprocal dislike" is shown by such expressions as "hits me," "bad to me," "talks about me." Less personal explanations are, "naught screamer girl," "have bad habits." An explanation, whose altruism has yet an egoistic strain, is, "punched my baby's eyes out;" and an oracular response is the remark, "I have reasons." More than half of those who have no dislike for people explain that there is no cause for ill feeling; about one-sixth entertain no dislike because "it is wicked," or from other moral grounds, as for instance this, "God made them all." Some other explanations are given, among them that of the little time-server who says, "I do not exactly hate any one, because I like to be on good terms with them."

If those are excluded who mistake fear for dislike, only about half these children "dislike things." This result would seem an

[1] The per cents. are on the basis of the totals in the horizontal column.
[2] Includes those who give doubtful answers, those who mistake fear for dislike, and those who do not answer.

unlikely one if very little children were not known to be so generally friendly to their environment. As a matter of fact, less than one-third of the children under six, but fully three-fifths of the older ones, have dislikes for things. Yet the detested objects, as well as people, are significantly fewer than the parallel objects of affection, so that, whatever allowance is made for inaccuracy in the record, the feeling of dislike is at least shown to lack intensity. Friendliness and content, rather than hostility and dissatisfaction, seem thus to be the normal disposition of the child; his antagonisms and his cruelties are the results of carelessness and of undue self-absorption, rather than of distinct unkindness; and expansion of the friendly and happy impulses is more necessary than the repression of the unsympathetic and the discontented.

In spite of their small number, the objects of dislike are not easily classified, for the children seem to be more individual in their dislikes than in the other emotional activities, showing clearly that distaste is little subject to rules and conventions. The loss of individuality, occasionally noticed in the first school years, is not apparent here. The "things disliked" are, nevertheless, subject to a certain tabulation.

TABLE X.

Objects of Dislike.

AGES.	OBJECTS.					Total.
	Food.	Painful Things.	"Moral" Things.	Work.	Unclass. and Unspec.	
Under 6	7 (30.4%)	0	0	0	16 (69.5%)	23
Betw. 12-14	26 (33.7%)	8 (10.4%)	12 (15.6%)	9 (11.7%)	22 (28.5%)	77
Totals	33 (33%)	8 (8%)	12 (12%)	9 (9%)	38 (38%)	100

The classes speak for themselves. Distastes—in the literal sense—are first in the list. Among the unclassified objects are some apparent instances of æsthetic displeasure, and the absence of any corresponding cases among the likes suggests the occasional origin of the æsthetic sense in the consciousness of the unpleasing rather than through the delight in the beautiful. Two of these objects of possible æsthetic displeasure are mentioned by the youngest children; these are "dirt" and "tunnels." The explanation of this latter dislike points its æsthetic nature: "I can't see the pretty things in a tunnel." Among older children the dislike of "the street" because it is "so dusty," of "playing in the dirt," and of "torn clothes,"—may be grouped under the same head.

IV.

A consideration of the moral ideals of these children is closely connected with the main purpose of our study, since the emotional factor is so significant in the moral consciousness, especially in that of children. The most remarkable feature of the following summary of the answers from younger children is the great prominence of the sense of wrong.

TABLE XI.

AGES.	PREVALENCE OF SENSE OF RIGHT.		Total.	OF WRONG.		Total.
	Consc. of Right.	No Answer.		Consc. of Wrong.	No Answer.	
Under 3	6 (26.0%)	17[1] (74.0%)	23	7 (30.0%)	16 (70.0%)	23
Between 3-6	30 (57.7%)	22 (42.3%)	52	45 (86.6%)	7 (13.4%)	52
Total	36 (48%)	39 (52%)	75	52 (69.3%)	23 (30.7%)	75

More in detail, we may classify the lists of acts named "right," according as they refer to the characters of the actors themselves, as being "good," "truthful," "tidy," or "grateful;" or to activities affecting others, like "doing errands," "paying debts," "championing sister's cause;" or to religious duties, like "being quiet in church" and "loving God;" or, finally, to the negative virtues of avoiding such wrong doing as fighting, lying, swearing, stealing, smoking. Some of the virtues named, such as "playing with blocks" and "going to the seashore," defy classification.

TABLE XII.

Acts named "Right." *a.* (Different ages.)

AGES.	Egoistic.	Altruistic.	Religious.	Negative.	Miscel.	Total.
Under 6	17 (21.2%)	38 (47.5%)	8 (10.0%)	2 (2.5%)	15 (18.7%)	80
Between 12-14	97 (27.0%)	92 (25.6%)	81 (22.5%)	27 (7.5%)	62 (17.2%)	359
Total	114 (26%)	130 (29.6%)	89 (20.2%)	29 (6.6%)	77 (17.5%)	439

b. (Boys and Girls, under 6.)

SEX.	Egoistic.	Altruistic.	Religious.	Negative.	Miscel.	Total.
Boys	9 (18.7%)	23 (47.9%)	3 (6.2%)	2 (4.1%)	11 (22.9%)	48
Girls	8 (25%)	15 (46.8%)	5 (15.6%)		4 (12.5%)	32
Total	17 (2.12%)	38 (47.5%)	8 (10%)	2 (2.5%)	15 (18.7%)	80

[1] Of these, the idea of right and wrong is "just beginning" in the case of three.

c. (Boys and Girls, between 12 and 14.)

Sex.	Egoistic.		Altruistic.		Religious.		Negative.		Miscel.		Total.
Boys	48	30.2%	30	18.8%	31	19.5%	20	12.5%	30	18.8%	159
Girls	49	24.5%	62	31 %	50	25 %	7	3.5%	32	16 %	200
Total	97	27%	92	25.6%	81	22.5%	27	7.5%	62	17.2%	359

This table indicates that the conception of religious duties is slight, while the realization of duty towards others is very prominent in children of six. As the child grows older he seems to give more attention to his own character and to religious duties which, also, are more personal. As before, the contrast between boys and girls is greater at twelve than at six and under, showing the effect of constantly diverging training. The greater inclination of the girls toward religious feeling, and the attraction of the boys to the combative virtues, are strong indications of two traditional errors of education: religious teaching is too exclusively reserved for girls, while on the other hand, sermons about characteristically boyish sins, fighting, swearing and the like, crowd out the no less necessary warnings against the temptations to selfishness, vanity and gossip, to which girls are more often subjected.

A similar summary of "wrong" actions gives the following results. Distinctions between girls and boys are unimportant, and therefore omitted, but it may be observed that the six years of school life seem to work more changes in the boys than in the girls.

TABLE XIII.

Acts named "Wrong."

Ages.	Egoistic.	Altruistic.	Religious.	Negative.	Miscel.	Total.
Under 6	16 (12.5%)	49 (38.2%)	9 (7.0%)	29 (22.6%)	25 (19.5%)	128
Between 12-14	19 (5.1%)	56 (15.1%)	8 (2.1%)	271 (73.4%)	15 (4.0%)	369
Total	35 (7%)	105 (21:1%)	17 (3.4%)	300 (60.4%)	40 (8%)	497

Acts directly affecting others, here acts of unkindness, are evidently prominent still among the moral ideals of the younger children. Transgressions of religious ceremonial seem less important than the corresponding religious observances. The replies of the children are particularly refreshing, at this part of the investigation, guilelessly revealing the secrets of childish hearts and penetrating to the most intimate habits of the homes. "To show temper," "to hurt birdies," "to pull dollies' hair out," and "to wake baby on purpose," are characteristic faults. The pitiable environment of the children who number among the cardinal sins the crime

of "touching bric-a-brac" is clearly disclosed. The boy who thinks it wrong "for sister to take my candy" defines his morality, as Fichte says, in terms of rights rather than of duties. Finally, the child who counts it wicked to "to make rhymes without sense" has a career of literary reform wide open to him.

The general result of this study is, then, a fresh accentuation of the significance of training, for of every special conclusion, this inference seems to form a part. Even the emotional life, seemingly erratic and uncontrolled, is both limited and widened by the guiding influence of custom and of education. In a very real sense parents and teachers are responsible for children's hopes and fears, for their likes and dislikes, and for the nature of their moral ideals.

KATHARINE FACKENTHAL.

B. EMOTIONS OF DEAF CHILDREN COMPARED WITH EMOTIONS OF HEARING CHILDREN.

This paper embodies the conclusions from a comparison of the emotions, fear, love and hate, and of the moral sense of forty deaf persons with the like emotions and the moral consciousness of as many hearing children. The comparison is given by a tabulation, with comments, of all their statements, followed by a reproduction of the papers of a congenital deaf-mute thirteen years old and of two hearing children of the same age. The inquiry relates, first, to the variety and scope of the answers given, but secondarily to the character of the replies.

The deaf children are pupils in the Iowa School for the Deaf, and to their instructors I am indebted for my material. The records of the hearing children were taken at random from a set of 200 obtained by Miss Fackenthal[1] for a more detailed study.

The ages of the deaf range from eleven years to twenty-three, while those of the hearing are from nine to fourteen: only eleven of the deaf are under fourteen years of age. However, judging from the data and from my experience as companion and teacher for thirteen years of the deaf and dumb, I venture to say that those between the ages of fifteen and twenty-three have not received any more years of instruction than those under fifteen years of age. It is true of deaf-mutes as well as of speaking children that they do not learn so easily or develop so rapidly if they enter school when quite advanced in age. Consequently throughout the comparison, this fact should be borne in mind, and the deaf-mute credited accordingly.

The questions[2] sent out were as follows:—

I. Fear.
   a. What do you fear most? (Name several things in order of intensity.)
   b. Why?
   c. Have you always been afraid of these things?

II. Love.
   a. 1. Do you love any *person* or *persons* very much? as parents, playmates?
      2. Why?
   b. 1. Do you love *animals?* (Name several in order of prefer-

[1] See page 319.
[2] Formulated by Miss Fackenthal

2. Why?
c. 1. What *things* do you love the most?
2. Why?

III. Hate.
a. 1. Do you hate any *person*?
2. Why?
b. 1. Do you hate any *thing*?
2. Why?

IV. Moral Sense.
a. Name three things which are wrong to do.
b. Name three things which are right to do.

V. What are you going to be when you are grown up?

The tabulation of the answers is as follows:

TABLE I. FEAR.

NUMBER OF OBJECTS OF FEAR.[1]

	Robbers.	Animals.		Ghosts	Nat're[2]	D'ng'rs	Misc.	Total[3] Imag'y	Total Real.	Total Obje's
		Wild	Dom'st							
Deaf	19	75	17	3	6		5	75	50	125
Hear'g	4	54	8	4	36	12	7	44	81	125

The number of objects of fear is thus exactly the same for both classes. The most interesting difference is the far greater number of imaginary fears on the part of the deaf, a result, probably, of the comparative isolation of their lives. A study of the different distinct fears (excluding cases of the repetition of the same object in several lists) shows that the deaf fear ninety-nine different objects, while the hearing fear ninety-two. This indication of greater originality on the part of the deaf is noticeable, because it seems to contradict the conclusions from the records of other sorts of emotional experience. It may probably be explained by the fact that so primitive and instinctive an emotion as fear is likely to have many manifestations in a relatively undeveloped consciousness.

All the children love persons, especially parents and playmates, and the reason given, in almost all cases, is the same: "Because they are kind to me." The summary which follows considers not the entire number of objects of love, but the different varieties of objects mentioned. Thus, thirty-five different kinds of animals are mentioned by the deaf, and only sixteen by the hearing, but the favorite animal, the horse, figures twenty-eight and twenty-nine times respectively in the lists. All classes of things loved "in common" appeal to the sense of taste, with the one exception of flowers, mentioned by eight hearing children and by only one deaf child. There are but two of the deaf who do not love "things to eat," while all, save one, of the hearing mention some things which appeal to the higher senses — facts which indicate the difference in development between the two classes. The figures are these:—

[1] It will be noticed that people, animals, etc., were not specified in the questions about fear as in the others.
[2] Under the head of "Nature" are included fire, thunder, lightning, blizzards, etc.
[3] Among imaginary objects have been classed wild animals (except snakes) and robbers. Snakes comprise about one-third of each "wild animal" class.

III. *Hate.* a. 1. Yes. 2. I do not like to see the persons cross, quarrel, ugly face at me (make an ugly face). b. 1. I hate ugly things. 2. Because I like beautiful things.

IV. *Moral Sense.* a. To lie, to sneak, to be lazy. b. To study, to help people, and love God and people.

V. I am going to be married. Because I will have a beautiful home.

Name, Charles I. Age, 13 years, 6 months.

I. *Fear.* a. I fear an earthquake, tornado and thunder storms. b. I fear them because they sometimes kill people, and make them homeless. c. I do no (not) fear slight shocks of them.

II. *Love.* a. I like my playmates, and am very fond of my Parents. I like them because they play with me and I play with them, (2) and I like my parents because they give me all my wants. b. 1. I like the pug dogs, Newfoundland and water spaniels. c. I am fond of base ball, because it gives me enjoyment.

III. *Hate.* a. 1. I do not exactly hate any persons. 2. Because I like to be on good terms with them.

IV. *Moral Sense.* a. Three things wrong are to swear, to be vulgar, and smokeing. b. Three things right are manly, goodness, and shun bad company.

V. I am going to be a railroad man. Because my father was nearly all his life.

It is clear that the deaf girl, Martha T., surpasses both hearing children in the thought and in the expression of her paper. The difference is less marked between her and Charles I., yet his carelessness in spelling and his confusion of nouns and verbs in co-ordinate construction leave the palm with her. Indeed, as a general rule, the hearing are inferior to the deaf through careless spelling and through inaccurate repetition and omission of words. The most significant feature of Martha's paper is its manifestation of her appreciation of beauty, suggesting that the deficiency in æsthetic sense, already noticed in the deaf, might be remedied by careful training. The deaf child's explanations, also, are all given clearly and well, showing good reasoning power.

The confident assertion may be made that though in the variety of the objects of their imagination and their feeling, deaf-mutes are inferior to hearing children, yet in expression, in originality, and in reasoning ability, they compare favorably with the more fortunate, especially considering the difficulties which they encounter in their efforts to share the experience of others and to communicate their own thought.

MARY E. BOWLES.

C. CHILDREN'S STORIES.

The stories of which this paper presents a study were written by children in the public schools of a Massachusetts town. The children were asked simply each to write a story on any topic whatever, so that the subjects as well as the stories are entirely original. Children in all departments of the school are represented, and the ages vary from three and one-half to fifteen years. The stories are grouped under four heads:

1. Stories written by children in the primary department, averaging six and one-half years.
2. Stories by scholars in the intermediate school, averaging nine years.
3. Stories by members of the lowest class in the grammar school, averaging eleven years.

4. Stories by children in the highest grammar school class, averaging fifteen years.

The total number of stories is 137, and there are about 30 in each set, except the first, which contains 48.

Considering, first, the choice of subject, it is found that there is a decided preference shown for subjects of real life, and that real and personal possessions and experiences hold by far the largest place. Out of the 48 stories written by the youngest children, 18 are about personal possessions and 12 about personal experiences. "My Kitty," "My Doll," "My Dog" and "Going after Mayflowers" are among the number. The remainder refer to possessions and experiences of others, as "Fanny's Doll" and "My Aunt's Baby," or else are on some general subject, like "The House." The subjects of the stories written by the next older children, those who are nine years old, show a somewhat different character. Out of 33 stories only 7 are about personal possessions, "My Cat and Dog" and "My Little Sister;" 6 refer to personal experiences, "Mayflowers," "School," etc.; 6 are fairy tales, "Prince Rosetti" and "The Adventures of a Prince" among the number; 5 are on general subjects like "Trees," "Spring," "Summer," etc., and the rest are recitals of the experiences of friends or near relatives. In the next group, there is only one subject relating to a personal possession, in this case a beloved kitten; 17 are about personal experiences, and by far the greater number of these refer to some trip which the different children have taken at some time; 4 are on the general subjects, "Coal," "Trees" and "Baskets," and the remainder, as in the previous group, refer to the experiences of others. There is still one more group to examine as to choice of subject, namely, the stories of the oldest children. These do not seem to have the fondness for relating personal experiences and for telling about their own possessions which have been found so characteristic of the younger children. There are only 3 stories referring to personal experiences, the subjects being "Fishing" and "Quahauging," and only one which speaks of a personal possession, a bull-dog. The majority of these subjects are about people; among them might be mentioned "The Story of a Good Girl," "Two Mischievous Boys" and "A Bad Boy."

Merely a glance at a story is sufficient to determine whether it is written by a boy or by a girl. For instance, in the first group kittens and dolls seem to have the principal charms for girls, while the boys prefer dogs, especially if fighting, hunting woodchucks, chasing squirrels, and fishing. In the second group the girls still show a preference for kittens and dolls, though the former have now grown to cats. The subjects in this case are such as "My Cat and Dog" and "The Story of a Cat." The boys still enjoy fishing and write on other outdoor subjects, as sheep, tigers, base-ball, etc. It happens that in the third group the proportion of girls far exceeds that of boys, hence one cannot fairly judge concerning either, but as the figures stand, the same general conclusions might be drawn as from the previous group. It is a little singular and at the same time characteristic that these two subjects come side by side, "A Trip to Old Orchard" and "Sailing on a Raft." The trip might of course have been taken either by a boy or by a girl, but it is hardly necessary to label the second story as written by a boy. In the fourth group the girls have as a whole outgrown their kittens and dollies and turn their attention both to boys and to girls. Among the subjects are: "Story of Two Little Girls," "A Good Girl," "A Boy Who was Lost" and "Two Mischievous Boys." The boys, however, write about dogs, about horses and about themselves, but not in a single instance have they deigned even to mention a girl. A few of their

subjects taken at random are "A Bull-dog," "Story of a Horse" and "A Bad Boy."

Of the 137 stories, 16 are on nature-subjects; 39 are about animals, and 67 are concerned with people, including the writers themselves. The remainder would come under the general heads previously mentioned and under that of "dolls." The girls show a fondness for these, which far exceeds that of the boys for any one thing. The stories themselves show a general increase in length as the children grow older, and a general advance in method of treatment. There are few in the whole number which appear to be direct reproduction of stories read or heard, although there are more showing evidence of this in the oldest group than in the youngest; indeed there are none of the first group which appear to belong to this class. Nearly all stories are told quite seriously, in fact I think only two out of the whole number show any sense of humor. One belongs to a little boy in the primary department, and a portion of it reads as follows: "Once there was a squirrel that had three ears: two ears on his head, and one ear of corn in his mouth." The other is about a little boy who went fishing one day and caught a shad and a flounder. "The next day," as the little writer says, "he went again, and what do you suppose he caught?—He caught a ducking." The children do not deal with serious subjects at all, but tell their stories in a grave, earnest manner.

Regarding now the length of these stories and their structure, we find that those in the first group are very brief, varying from nine to sixty words; they can scarcely be said to have a plot, since they consist only of a few brief statements. Most of the stories in the second group have a certain plot and a definite climax; they are all considerably longer than those of the first set. The third group resembles the second, and the stories of the fourth show a further development: they have a real aim and are usually descriptions, though sometimes in narrative form.

In the following tables the most important of these results are summarized:

I. CLASSIFICATION OF SUBJECTS WITH REFERENCE TO AGE OF CHILDREN.

AGES.	SUBJECTS.						Total
	Pers'l Possession	Pers'l Exp'ces.	Possessions of Others.	Exp'ces of Others.	Fairy Subjects.	General Subjects.	
Av. 6½ yrs	18=37.5%	12=25.0%	2=4.1%	11=22.9%	0	5=10.4%	48
" 9 "	7=21.2%	6=18.1%	1=3.6%	8=24.2%	6=18.1%	5=15.1%	33
" 11 "	1=3.8%	17=65.3%	1=3.8%	3=11.5%	0	4=15.3%	26
" 15 "	1=3.3%	3=10.0%	5=16.6%	21=70.0%	0	0	30
Total	27=19.7%	38=27.7%	9=6.5%	43=31.3%	6=4.3%	14=14%	137

II. Comparison of Subjects chosen by Boys and by Girls.

Ages.	Subjects.					
	Pers'l Possessions.		Pers'l Experiences.		Possess'ns of Others.	
	Boys	Girls	Boys	Girls	Boys	Girls
Av. 6½ yrs	8=32.0%	10=43.4%	8=32.0%	4=17.3%	5=20.0%	8=34.7%
" 9 "	2=10.5%	5=35.7%	3=15.7%	3=21.4%	7=36.8%	2=14.3%
" 11 "	0	1=5.0%	4=66.6%	13=65.0%	0	4=20.0%
" 15 "	1=8.3%	0	2=16.6%	1=5.5%	9=75%	17=94.4%
Total	11=17.7%	16=21.3%	17=27.4%	21=28.0%	21=33.8%	31=41.3%

Ages.	Fairy Subjects.		General Subjects.		Totals.		Total Subjects.
	Boys	Girls	Boys	Girls	Boys	Girls	
Av. 6½ yrs	0	0	4=16.0%	1=4.3%	25	23	48
" 9 "	5=26.3%	1=7.14%	2=10.5%	3=21.4%	19	14	33
" 11 "	0	0	2=33.3%	2=10.0%	6	20	26
" 15 "	0	0	0	0	12	18	30
Total	5=8.0%	1=1.33%	8=12.9%	6=8.0%	62	75	137

A brief study has been made of the language of the stories, leaving out of regard, however, the stories of the third and fourth groups, since their authors show an understanding and use of language differing only in slight degree from those of adults. In the stories of the younger children, the parts of speech used are mainly nouns and verbs, and more of the former. These nouns are almost without exception the names of persons and of familiar objects. Pronouns, chiefly personal, hold the next place, followed by articles, adjectives and prepositions. The adjectives refer generally to size and to beauty, "large" and "pretty" playing a very prominent part. Conjunctions are very rare; more than half the stories written by the youngest children are quite guiltless of them.

In the following table a summary in per cents. of the parts of speech used by these youngest children is compared with Mr. Tracy's summary[1] of the language of children under three years, and with the statistics of adult language, which he quotes from Mr. Kirkpatrick.

[1] "Psychology of Childhood." page 81.

Mr. Tracy's conclusions are based on a study of 5,400 words; ours, which are drawn from the observation of only 500 words, written, not spoken, are not of any demonstrative value, but may be suggestive.

	Nouns.	Verbs.	Adjectives	Adverbs.	Pronouns.	Prepositions.	Conjunctions.	Interjections.
Babies (T)	60.0%	20.0%	9.0%	5.0%	2.0%	2.0%	0.3%	1.7%
Average 6½ yrs. (E)	27.8%	17.7%	17.4%	5.8%	17.1%	7.9%	0.6%	0
Adults (K)	60.0%	11.0%	22.0%	5.5%				

The smaller per cent. of nouns on our lists, as compared with Mr. Tracy's, is partly due to the fact that pronouns, which are almost lacking in the vocabularies of the very youngest children, but which are prominent in our stories, may virtually be classed as nouns. The rarity of nouns as compared with the proportion of nouns in the language of adults, in connection with the large proportion of verbs, shows forcibly the greater importance of verbs in a child's vocabulary. This conclusion confirms that of Mr. Tracy's study.

SUSIE W. EATON.

D. CHILDREN'S DRAWINGS.

This paper gives the results of a study of children's drawings, on exactly the lines of the investigation already reported by Professor Earl Barnes in the PEDAGOGICAL SEMINARY of December, 1893. Records were received from 451 children, of whom about 125 lived in a New England country town, and the rest in Washington, D. C. There are twice as many girls as boys, and all ages are represented. The poem selected by Professor Barnes, "Johnny Look-In-The-Air," was read to the children, who were told to draw one or more pictures illustrating the story. 1,324 different pictures were drawn, including scenes and separate objects. From seven to twenty or twenty-five minutes were spent on the drawing.

Inquiring, first, the subject of greatest interest to the children, we find that about one-sixth (15.1%) of all the pictures represent Johnny meeting the dog, that about one-twelfth (8.6%) depict the hero floating in the river, and that nearly one-tenth (9.1%) portray his rescue; while only one-sixteenth (6.2%) concern themselves with his approach to the river. These boys and girls therefore agree, for the most part, with Professor Barnes's children in that they are more interested in the scenes just before and just after the crisis than in the catastrophe itself. The rescue scenes, however, are only slightly more numerous than the sketches of Johnny falling into the water—occurring only one-third more often, instead of twice as often, as in the California drawings. The prominence of the scene may also be explained in part by its close connection with the favorite floating-in-the-river picture, of which it is an obvious continuation. On the whole, then, Professor Barnes may not be justified in drawing from this fact the conclusion that "in children the feeling of mercy and helpfulness is much more prominent than the desire to destroy."

Boys and girls generally follow the same lines of interest and development: the boys express themselves a trifle more fully than the girls, but the difference is small.

In the collation of the drawings to verify Professor Barnes's conclusions about the drawing of full faces and of profiles, the representations of the rescuers, as well as of Johnny, were considered—1,313 faces in all. The following table shows the increase in the use of profiles:—

AGES.	5 to 6	7	8	9	10	11	12	13	14
Per cent. of profiles	9.5%	15.6%	35.7%	63.7%	53.5%	69%	59.6%	67.3%	68.7%

Among children of nine years and more, the profile seems to be established, though with fluctuations, due perhaps to accidental causes. A transition period, in which a profile is enriched with two eyes and with the nose and mouth characteristic of a full face, is observed in the drawings.

From the transparent and diagrammatic figures of the early pictures, there is a steady advance to such regard for reality as is shown in the pictures which draw Johnny floating in the water in profile, while the rescuers, looking toward the river, have full faces; or in those which, illustrating Johnny's fall, have drawn only his legs and part of his body as he is disappearing into the river. The absence of decoration, the undue enlargement of Johnny's figure and other characteristics of the pictures, show clearly that drawing is a language to these children, employed not to imitate nor to please, but to express meanings.

Most of the conclusions from this shorter study are thus corroborative of those of Professor Barnes, though these pictures seem to show more traces of logical arrangement and do not indicate any strong instinct of humanity. The suggestion that the study of drawing should usually be begun at about nine years—after the diagrammatic and before the self-conscious age—is certainly confirmed by our observation.

MARY A. HERRICK.

E. NOTES ON THE FIRST THREE YEARS OF A CHILD.

Like all sciences, psychology depends largely in its advance upon the multiplication of accurate observations and records of individual instances; and, in the nature of the case, this is especially true of child-psychology, whose data are still very few, when judged in the light of the important conclusions which are reached through them. This paper embodies the most significant results of the observation of a child, known to the writer, compared with the parallel records of Preyer, Darwin, Miss Shinn, Polluck, Taine and Tracy.

The child, who will be called Allen, is a healthy boy of American parentage, now three and a half years old. He has been carefully trained, with especial avoidance of any forcing of childish abilities or accomplishments. The records were made by the mother, who has been a teacher and is interested in scientific subjects, but many of the facts recorded have been observed by the writer, who is intimately acquainted with the family. The records were made with no thought of publication, and therefore most of them were several days, or even weeks, later than the events recorded. Nothing, however, was recorded of which the mother was not absolutely sure, and dates were *never assigned by guess*, without some certain date from

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d. Z. Dekan.

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Einleitung

Paidologie, die Wissenschaft des Kindes, hat die Aufgabe, alles zu sammeln, was das Wesen und die Entwickelung des Kindes betrifft — wo auch immer dieses Material gefunden werde — und es zu einem systematischen Ganzen zu vereinigen. Ihr einziger Zweck ist das wissenschaftliche Studium des Kindes nach allen Richtungen, zur Erlangung eines vollkommenen Verständnisses seiner Natur. Sie muss die Untersuchungen am Kinde vornehmen, um die Thatsachen festzustellen, welche das Material für die übrigen Wissensgebiete und die Praxis geben, deren Ergebnisse dann später wieder der Bethätigung am Kinde zur Grundlage dienen müssen. Die Paidologie wird ihre ganze Aufmerksamkeit auf das Kind concentriren, es in einen Brennpunkt stellen, so dass alle Kräfte, alle Apparate, alle Unternehmungen um diesen Mittelpunkt geordnet werden, um damit ein gründliches Studium der Sache zu ermöglichen. Specielle Forschungen müssen unternommen, specielle Apparate hergestellt, specielle Methoden des Studiums ersonnen werden; spezielle und hervorragende Aufmerksamkeit muss dem Kinde gewidmet werden zu allen Zeiten, in allen Lagen, unter allen Verhältnissen, unter welchen die Phänomene der Kindesnatur sich entfalten. Das Kind muss im Laboratorium, im Hause, auf der Strasse, bei seinen Spielen und Scherzen und Kämpfen studirt werden; es muss studirt werden unter civilisirten und uncivilisirten Völkern, in seinen

normalen und abnormen Phasen, in den fötalen und in allen folgenden Stufen der Entwickelung, in Rücksicht auf psychologische, physiologische und moralische Verhältnisse, im Zustand der Ruhe und im Zustand der Thätigkeit, im Wachen und Schlafen, in Krankheit und Gesundheit. In der That, das Werk der Paidologie ist das Studium des Kindes in seinem gesamten Wesen. Sie bildet nicht einen Theil irgend eines anderen Wissensgebietes, sondern steht allein, in sich abgeschlossen an ihrer eigenen Stelle.

Von allen Gegenständen auf dieser Erde, welche unsere Aufmerksamkeit in Anspruch nehmen, dürfte keiner unserer wissenschaftlichen Betrachtung würdiger sein, als das Kind. Seine Pflege und Erziehung beansprucht unsere grösste Aufmerksamkeit und Denkkraft. Das Amt der Eltern ist der heiligste Beruf. Zu einem solchen Amte sollten der junge Mann und das heranwachsende Weib eine sorgfältige Anleitung empfangen. Ein gründlich gebildeter Vater und eine fein gebildete Mutter sind ein grosser Segen für das Kind, wenn die Erziehung von Rücksichten auf das Kind geleitet wird. Zuweilen fürchte ich jedoch, dass das Schulwesen von dem Kinde viel mehr ablenkt, als zu ihm hinführt. Immerhin glaube ich, dass die Erziehung in unserer Zeit die beste ist, welche die Welt bisher gehabt hat, und dass im allgemeinen der junge Mann und das junge Weib zur Erfüllung ihrer Aufgaben befähigt ist. Nichtsdestoweniger und trotz der speciellen Erziehung, welche wir von den Schulen empfangen haben, sind wir, was das Wesen des Kindes betrifft, sehr unwissend; wir müssen uns daher bemühen, es in seiner ganzen Tiefe zu begreifen, sobald wir Eltern oder Lehrer werden, oder wenn wir in irgend einer anderen Beziehung mit dem Kinde in Berührung kommen. Sicherlich erfordert es eigene Erfahrung, für Kinder sorgen zu lernen; wenn man jedoch die Erfahrungen und Beobachtungen Anderer in richtig geleitetem Studium sich aneignen könnte und dann erst selbst mit dem Kinde zu thun hätte, würden diese vorher erworbenen Kenntnisse von grösstem Nutzen

sein. Eine paidologische Abtheilung an der Hochschule würde den Studenten die Kenntnis des Kindes in möglichst wissenschaftlicher Weise verschaffen können. Die Erkenntniss der Nothwendigkeit einer solchen Einrichtung muss die Verwirklichung der letzteren nach sich ziehen. Mehr und mehr, in geradezu überraschender Weise hat die Geister jetzt das Interesse für alle die Studien ergriffen, welche sich auf das Wesen des Kindes beziehen. Untersuchungen werden angestellt, wie nie zuvor. Männer und Frauen aller Kreise arbeiten in mannigfaltigen Richtungen auf diesem Gebiete. Auch die Thatsache, dass die höheren Unterrichtsbehörden diesen Bestrebungen ihre Aufmerksamkeit, wenngleich erst in geringem Grade, zuwenden, spricht dafür, dass die Sache von Wichtigkeit ist. Das lebhafte Interesse und der wissenschaftliche Geist, in welchem die Untersuchungen angestellt werden, beweisen, dass das Studium des Kindes begonnen hat, eine feste Grundlage zu gewinnen. Es liegt also durchaus ein Bedürfniss vor, auf den Hochschulen eine specielle Abtheilung zu gründen, die sich allein mit diesem Studium beschäftigt.

Eine solche ist nothwendig, damit alle Aufmerksamkeit auf das Kind concentrirt und alles, was das Kind betrifft, richtig gewürdigt werden kann. Denn in den jezt existirenden Lehrfächern ist die specielle Lehre vom Kinde nur ein Gebiet von untergeordneter Bedeutung. Für jedes Werk aber, welches richtig durchgeführt werden soll, muss ein Mittelpunkt bestehen, um welchen sich alle nothwendigen Einzelarbeiten gruppieren können; und diesen nothwendigen und wichtigen Mittelpunkt bildet die Paidologie. Hat sie einmal Anerkennung gefunden, so kann das Werk systematisch und ohne jede Zersplitterung betrieben werden. Ein durchaus systematisches Studium des Kindes aber ist nicht möglich, bevor wir eine Wissenschaft besitzen, deren spezielle und einzige Aufgabe eben dieses Studium ist. Diese Abteilung ist auch deshalb nothwendig, damit dem Studium des Kindes ein stetiges Wachsthum ermöglicht wird. Da

jetzt noch leider die einzelnen Zweige unabhängig von einander arbeiten, und so jedes einzelne von dem Wirken der übrigen nur wenig erfährt, kreuzen sie sich alle, ohne den nötigen Zusammenhang zu finden. Ist aber ein Centrum vorhanden, um welches alle Studien des Kindes sich gruppiren, so kann jeder Mitarbeiter auch das Werk der anderen übersehen und hierdurch das eigene fördern. Dieses Lehrfach ist nothwendig, weil die Gedanken über das Kind einen Wohnplatz finden, und Materialien gesammelt werden sollen, um die Verfolgung dieser Gedanken zu ermöglichen, ferner weil wir von dem Kinde zu lernen wünschen, wie das Menschengeschlecht ehedem war; zu lezterem Zweck muss alles geschehen, was zur Beantwortung unserer Fragen überhaupt gethan werden kann, — und dies vermag eine Wissenschaft, die unsere Sache nur nebenbei behandelt, schlechterdings nicht zu leisten. Die Paidologie ist noch deshalb nothwendig, weil sie ein Postulat des gesunden Verstandes ist und sich mit Problemen von grösster Wichtigkeit beschäftigt, welche ergründet sein müssen, wenn wir den besten Interessen der künftigen Menschheit dienen wollen.

Die Erziehung der Jugend muss so gelenkt werden, dass die Kräfte der Seele und des Körpers zu möglichst vollkommener Entfaltung gelangen. Dazu sollte die Erziehung einen jeden aufs beste befähigen, die Anforderungen zu erfüllen, welche später einmal das Leben stellt. Was man auch immer zu thun haben mag, es muss alles mit dem Kinde in Beziehung gebracht werden. So sollten die öffentlichen Studien darauf angelegt sein, dass sie dazu beitragen, das Verständniss der Kindesnatur zu erschliessen. Das Studium der Paidologie sollte die beste allgemeine Vorbereitung für ein Wissen vom Kinde sein, das der Student erlangen kann. Oft fragt man, von welcher praktischen Wichtigkeit ein Gegenstand sei, der auf der Universität gelehrt wird. Offenbar sind die Ergebnisse der Paidologie die denkbar praktischsten; denn sie betreffen einen Gegenstand, der mehr, als jeder andere, praktische Kenntnisse fordert. Wie schon

dargelegt, ist die Paidologie eine reine Wissenschaft und keine angewandte; daher hat sie es mit der Erforschung aller das Kind betreffenden Dinge zu thun, die Anwendung dem jeweiligen Bedürfnisse überlassend. Der Fälle, in welchem ihre Ergebnisse angewendet werden, giebt es so viele, dass ihre Aufzählung unmöglich erscheint. Ihre Ergebnisse werden den Eltern von allergrösstem Werthe sein, denn sie haben mit den Kindern am meisten zu thun. Dann folgt die Anwendung auf die Schule, denn nächst dem Hause ist sie der Platz, wo man in engste Beziehung zu dem Kinde tritt. Was dem Lehrer jetzt vielfach mangelt, ist nicht Gelehrsamkeit oder Methodik, als vielmehr Kenntniss des Kindes. Unsere Pädagogik hat bisher das Kind nicht eingehend genug studirt, sie hat sich beschäftigt mit der Geschichte der Erziehung, den Methoden des Lehrers, dem Studiengang u. s. w. Die Paidologie wird das Material schaffen, worauf die Pädagogik sicher bauen und sich zu der Stellung, die sie einnehmen sollte, erheben kann. Das Werk der Paidologie wird auch von grosser Wichtigkeit für den moralischen und religiösen Unterricht des Kindes sein; denn es muss sich ein wesentlicher Theil ihres Studiums mit den moralischen und den religiösen Gefühlen des Kindes befassen. Sie wird fragen: Was sind die Gefühle? Mit den methaphysischen Lehren wird sie sich nicht begnügen, sondern in Rücksicht auf diese wichtigen Dinge nach dem Kinde selbst fragen. Die Paidologie wird eine Wohlthat für den Studenten der Medizin sein, denn sie hat das Kind in der Krankheit, psychisch und physisch, so gut als in der Gesundheit zu studiren. Sie wird dem Geschäftsmanne und Landwirthe, u. s. w. zu Diensten sein, insofern sie die Natur des Kindes in Hinsicht auf sein Gefallen an einer Berufsthätigkeit oder seinen Widerwillen dagegen erforschen und so eine Grundlage bilden wird, auf welcher man ein Urtheil über die Berufswahl und die Versorgung des Kindes fällen kann. Der Gesellschaft und dem Staate wird durch die Ergebnisse der Paidologie in vieler Hinsicht genützt werden; denn ihre Stu-

dien werden sie mit dem nöthigen Material für die Gesetze und die staatliche Beaufsichtigung der Kinder versehen. Diese Einrichtungen würden dann auf eine wissenschaftliche und praktische Erkenntniss des Kindes und nicht nur auf eine Theorie gegründet sein. Dieses Werk wird auch den Veranstaltungen behufs Besserung der Kinder zu Hülfe kommen, da es das Kind in der Bosheit, in der Noth, in der Misshandlung studiren und von seinem Verhalten unter solchen Umständen lernen muss; dann erst, wenn solche Erfahrungen gemacht sind, können Gesetze und Reformen, die sich dem Wesen des Kindes durchaus anpassen, gefunden werden. — Kurz, die Ergebnisse der Paidologie werden in der That sich in jedem Geschäft, in jedem Beruf, in jeder Reform, in jeder Wissenschaft geltend machen, wo das Kind irgend einen Faktor bildet.

Die Einführung neuer Gedankengänge ist immer von mancherlei Schwierigkeiten begleitet. Ganz besonders wird dies in unserer neuen Wissenschaft des Kindes der Fall sein. Das Kind ist von einer so verwickelten Natur und so schwer zu verstehen, dass die Anlage dieses Studiums entschieden eine schwierige sein wird. So viele Wissensgebiete haben das Kind berührt, bald in dieser, bald in jener Hinsicht, sich so sehr gekreuzt und so widersprechende Resultate geliefert, dass das Material nur schwer zu sichten und zu ordnen ist. Doch mag dies auch viel Zeit und Mühe erfordern, es darf uns dies nicht abhalten, einen Anfang zu machen. Die Paidologie wird, wie gesagt, zuerst verschiedene Wissenschaften nach Material durchsuchen müssen. Man muss nicht nur weite Gebiete durchwandern, um zu finden, was sie für das Kind geleistet haben, sondern die Paidologie muss auch viele von den Gedanken jener aufnehmen und ihrem eigenen Werk einfügen. Man darf nicht denken, dass alle diese Wissenschaften das Studium des Kindes erschöpft haben; denn ihre Studien haben erst begonnen und so viele Seiten des kindlichen Wesens enthüllt, dass man immer neue Zugänge finden wird, die Wege zu

bahnen. Obgleich diese verschiedenen Nachforschungen Material in Fülle liefern werden, wird doch das Kind selbst das breiteste Feld für das unerschöpfliche Studium gewähren, und in ihm die Paidologie ihr reichstes und reinstes Material finden.

Der ganze Plan ist insofern neu, als frühere Centralisationsversuche nicht vorliegen; das Gebiet ist weit und wenig bearbeitet und wird daher viel Beobachten und Nachdenken, besonders aber viel Geduld bei der Arbeit erfordern. Doch ist es so vielversprechend, dass man allen vergeblichen Versuchen und allen Schwierigkeiten zum Trotze sich gewiss immer wieder ermuthigt fühlen wird, bei dem Werke auszuharren.

Geschichte der Paidologie

Dass das Studium des Kindes rasch zu einer Wissenschaft heranwächst, kann leicht durch eine Geschichte der einschlägigen Arbeiten illustrirt werden. Es ist merkwürdig, wieviel auf diesem Gebiete bereits gearbeitet worden ist. Ein einziger Blick auf die über das Kind in den verschiedenen Ländern gemachten Studien zeigt, dass ein tiefes Interesse für die Sache vorhanden ist, und dass diese Forschungen schliesslich ein besonderes Studium für sich werden bilden müssen. Zwar existirt erst seit wenigen Jahren eine entschiedene Neigung, die Studien auf diesem Gebiet zu centralisiren; sie hat jedoch in den letzten Jahren stetig zugenommen. Nicht nur nach ein oder zwei Richtungen sind diese Versuche gemacht worden, sondern nach vielen Seiten hin; und da die Paidologie dieses Gebiet erweitern will, werden sie bei Aufzählung der Studien über die verschiedenen Phasen des Lebens des Kindes angegeben werden. Natürlich können nur einige von den wichtigeren Studien angeführt werden.

In Deutschland schrieb Goltz[447]*) schon 1847 ein Buch über das Kind; jedoch Sigismund[468] war der erste, welcher gute Beobachtungen des kindlichen Wesens veröffentlichte**). Die ersten, von medizinischen Studien verschiedenen, syste-

*) Die Zahlen hier verweisen auf die Literaturangabe im Anhange.

**) Preyer: Die Seele des Kindes, 4. Aufl. S. 357.

matischen Untersuchungen an Kindern***) waren jene von Kussmaul[452]. Seitdem ist auf diesem Gebiete sehr viel gearbeitet worden. Ueber das Vorstellungsleben des Kindes haben Schwabe und Bartholmai[228], Härtmann[224], Burgerstein[199], Berger[198], Stoy[229], Lange[225], Rein[226], Schubert[227], über die Sinne Cohn[168], und zwar über das Gesicht, Weil[191] und Bezold[177] über das Gehör, Genzmer[170] über die Sinne der kleinen Kinder Untersuchungen angestellt. Im Bezug auf die Entwickelung, das Wachsthum, u. s. w. des Kindes sind die Schriften von Landsberger[390], Virchow[417], Kotelmann[389], Geissler[382], Carstädt[379], Henke[97], Vierordt[101] bemerkenswert. Ueber Hygieine, Krankheiten und Störungen der Kinder haben Emminghaus[82], Kafemann[115], Közle[72], Henoch[148], Ufer[79], Siegert[76], Trüper[78], Griesbach[195], Röse[188], Gerhardt[147] geschrieben; über die Sprache Keber[324], Strümpel[484], Treitel[339], Schultze[333], Kussmaul[348]. Ploss[28–29] hat uns eine ganz gute Skizze der Kindesnatur mit Rücksicht auf die Verschiedenartigkeit der Völker der Erde gegeben. Räuber[70] hat eine sehr interessante Seite des kindlichen Lebens besprochen. Die Studien von Hertwig[92] und von Ziehen[89] sind sehr wertvoll für unsere Forschung. Es ist in erster Linie Preyers Verdienst, den Grund zu einer systematischen Erforschung der Kindesnatur gelegt zu haben. Er hat es in der That ermöglicht, dass dieses Studium sich zu einer eigenen Wissenschaft entwickelte. Seinen Studien über das Kind im embryologischen Stadium[95] liess er ein sehr sorgfältiges Studium der ersten drei Lebensjahre des Kindes[481] folgen. Diesen Studien fügte er einige recht interessante Versuche am neugeborenen Kinde[484] bei. In diesem Sinne hat er eine Anleitung gegeben, wie Eltern und andere Personen am besten in die Erforschung der Kindesnatur einzudringen vermöchten[463]. Es ist ihm auch gelungen, für die einzelnen Zweige dieser

***) Burnham: The Pedagogical Seminary, II, 2, S. 191.

Arbeit besondere Aufmerksamkeit zu erregen und die Nothwendigkeit dieses Specialstudiums nachzuweisen; ja, er hat eine Wissenschaft — Psychogenesis[4] — gegründet, welche von denen, die die Kindesnatur studiren, schnell anerkannt wurde. Für das, was Preyer in dieser Richtung geleistet hat, kann ihm nie genug Ehre erwiesen werden; er muss als die erste Autorität auf diesem Gebiete gelten. — Wie intensiv das Studium des Kindes betrieben wird, ist aus den hierauf bezüglichen Artikeln in Rein's Encyclopädie[515] ersichtlich. Diese vortreffliche Encyclopädie bietet eine Fülle von Arbeiten, welche sich in der von uns, betreffs des Studiums der Kindesnatur, eingeschlagenen Richtung bewegen*). Auch giebt es eine Monatschrift, die in gleicher Richtung soviel Gutes bietet, dass sie ganz besondere Beachtung verdient; es ist die „Zeitschrift für Schulgesundheitspflege[513a]".

In Frankreich befindet sich ein Mann wie Taine[337] unter denjenigen, welche sich dem Studium des Kindes gewidmet haben; über die Sprache der Kinder hat er geschrieben. Derselbe Gegenstand ist von Egger[319] und von Deville[317] studirt worden. Moure[184] und Gellé[179] haben Beobachtungen über das Gehör der Kinder angestellt. Quegrot[213] hat ein Werk über die Einbildungskraft der Kinder geschrieben. Binet hat dem Studium der Kinder viel Aufmerksamkeit gewidmet; in seinen Arbeiten findet sich die Schilderung einiger interessanter Versuche betreffs der Wahrnehmung[215] und auch der Bewegung[371] der Kinder. Auch Perez hat hier Bemerkenswertes geleistet. Sein Werk ist sehr wertvoll, insofern zwei seiner Studien das Kind in zwei Stadien — von der Geburt bis zum Alter von drei Jahren[460] und sodann in den nächsten vier Lebensjahren[459] — darstellen, sodass das Wachsthum des Kindes in ununterbrochenem Fortgange geschildert wird. Perez hat auch die Aufmerksamkeit auf die Beobachtungen gelenkt,

*) Cf. die Abhandlungen über Altertypen, Beobachtung, Entwickelung, Ernährung u. s. w.

welche Tiedemann[461] vor hundert Jahren gemacht hat, Compayré hat grosses Interesse für diese Bewegung gezeigt, besonders hinsichtlich der moralischen Entwicklung[289] des Kindes. Er war davon überzeugt, wie richtig es sei, das Studium der Psychologie des Kindes selbständig zu betreiben und brachte hierfür die Bezeichnung „Paidoscopie“*) auf. Es giebt eine Gesellschaft in Frankreich, die zwar aus dem Studium des Kindes keine besondere Wissenschaft gemacht, dasselbe aber von einer sehr wichtigen Seite betrieben hat, sodass sie seine Selbständigkeit erwiesen hat. Dies ist „L'Union Française pour le Sauvetage de l'Enfant“[66].

In Dänemark hat Schmiegelow[187] das Gehör, das Ohr und den Nasenrachenraum der Schulkinder untersucht. Meyer[117] hat zweitausend Schulkinder untersucht und ein Procent mit Adenoiden gefunden. Hertel[125] und Malling-Hansen[391] haben die generelle Gesundheit des Kindes studirt. Höffding, in seiner Psychologie[237], anerkennt die Wichtigkeit des Studiums des Kindes.

In Oesterreich kam das Studium des Kindes schon damals auf, als Löbisch[458] 1851 sein Buch herausgab. Auch Krauss[514] ist für uns werthvoll, insofern sich in „Am Ur-Quell“ mehrere wichtige Beobachtungen aus dem kindlichen Leben finden**). Krafft-Ebing[260] hat Beiträge zu dem Studium der Geschlechtsempfindungen der Kinder geliefert. Bayr[119] und Kisch[108] haben das hygienische Gebiet bearbeitet. Gutzmann und Liebmann[857] geben eine sehr interessante Beschreibung der Arbeit an stotternden Kindern.

In Russland zuerst wurde das Gehör der Schulkinder studirt, und zwar durch Reichard[185]. Dieser Untersuchung folgten diejenigen Schermunskis[186] und Lunius[182]. Sikorski[834] und Simonovich***) haben die Sprache der

*) Cf. Revue Pédagogique, XXI., 1892, S. 305.

**) Cf. Science, XXII., 1893, S. 303.

***) Cf. den Artikel von Sikorski und auch Garbini, „Evoluzione della voce nella infanza“, S. 5.

Kinder studirt. Das Wachsthum und die Entwickelung der Kinder sind von Erismann[381] behandelt worden.

In Schweden stellte Key[378] mit einer amtlichen Kommission sehr sorgfältige Untersuchungen an den Kindern in den Schulen an über Wachsthum, Entwickelung, Gewicht, etc. In Norwegen widmete sich Hokonson-Hansen[386] dieser Aufgabe.

In Spanien hat Alvarez[315] Beobachtungen über die Sprache eines Kindes gemacht. In Belgien hat Sikorsky[205] die Ermüdung der Schulkinder studirt. In der Schweiz wird eine sehr wichtige Seite unserer Aufgabe diskutirt, wie aus Forels Büchlein[162] hervorgeht.

In Italien wächst das Studium des Kindes. Es ist hier einiges von Bedeutung geleistet worden. Poglioni[398] in erster Linie studirte das Wachsthum und die Entwickelung der Kinder. Sergi[414] hat darauf aufmerksam gemacht, dass die Pädagogik grösseren Wert auf das Studium des Kindes legen müsse; und er hat eine Tafel für die Beobachtung des Kindes in physischer und geistiger Beziehung angefertigt. Mantegazza[153] hat bemerkt, dass die Sinne der Kinder mit grosser Sorgfalt behandelt werden müssen. Ferri[428] hat das Kind in den ersten drei Lebensjahren studirt. Garbini[358] hat vortreffliche Untersuchungen über die Entwickelung der Stimme der Kinder, besonders der musikalischen Stimme, angestellt. Signorina Lombroso[455] hat hierzu wertvolle Beiträge geliefert.

In Grossbritannien hat sich das Studium des Kindes zusehends in der Richtung bewegt, einmal eine selbständige Wissenschaft zu werden. Characteristisch für den dort eingeschlagenen Weg ist die Bildung einer Gesellschaft[440], welche das wissenschaftliche Studium und die Beobachtung der Kinder als ihren besonderen Zweck betrachtet. Unter den vielen Männern, welche die Kindesnatur studirt haben, finden wir Darwin[427], der uns die an seinem eigenen Kinde gemachten Beobachtungen übergeben hat; diese gehören zugleich zu den Untersuchungen, welche an einzelnen Kindern

angestellt worden sind. Pollock[330] und Tarver[189] haben die verschiedenen Entwickelungsphasen der Sprache des Kindes studirt. Barr[176] hat das Gehör, Buxton[167] das Gesicht des Kindes untersucht. Jacobs[221] Untersuchung des Gedächtnisses der Kinder folgten Galtons[41] Studien über das Gedächtniss der Idioten. Roberts[409] hat das Gewicht und die Körpergrösse der Kinder in den verschiedenen Bevölkerungsklassen untersucht. Boulton[374] hat das Wachsthum und die Entwickelung der Kinder, sowohl vor als auch nach ihrer Geburt, studirt, Pye[406] die Art und Weise des Wachsthums des Körpers. Sturges widmete seine Aufmerksamkeit den Störungen der Kinder, besonders der Chorea[135] und den Herz-Störungen[144]; Dankins Buch[146] über Kinderkrankheiten bildet den Vorläufer einer Reihe solcher Bücher anderer Autoren. Palmberg[131] studirte die epidemischen Krankheiten in der Schule. Ireland[48], Dawn[38], und Beach[81] haben zur Erforschung defekter Kindesnaturen Bedeutendes geleistet. Galton[201] hat die Ermüdung der Kinder untersucht, aber Niemand hat auf diesem Gebiete mehr geleistet als Warner[490—418], der die physische Natur von etwa 50000 Kindern beobachtet und seine Ergebnisse in guter Form herausgegeben hat. Sully hat die Sprache[386] des Kindes studirt und auch sehr viele allgemeine Beobachtungen[5] der Kindesnatur gesammelt. Cloustoris Werk[81] ist für unsere Sache sehr wertvoll.

Man hat gesagt, dass Amerika bis jetzt keine Philosophie hervorgebracht habe. Es scheint jedoch — aus der Art und Weise zu schliessen, in welcher das Studium des Kindes aufgegriffen worden ist —, dass in Amerika eines Tages eine Philosophie entstehen wird, deren Grundlage die Psychologie des Kindes bildet. In keinem anderen Teil der Welt ist dieser Gegenstand so gründlich und energisch in Angriff genommen und so gut verstanden worden, wie in Amerika. Es ist merkwürdig, wie schnell sich der Gedanke allgemein verbreitet hat, dass dieses Studium ein selbständiges — ein

Ganzes für sich — ist. Als vor zwei Jahren der Verfasser dieser Abhandlung die Behauptung aufstellte[2], dass das Studium des Kindes ein besonderes bilden sollte, dass es seine eigene Abteilung verdiente und auch einst haben würde, dass es nicht der Pädogogik, der Psychologie, der Anthropologie oder irgend einer anderen Wissenschaft untergeordnet sein dürfte: da waren es sehr viele, welche die Wichtigkeit dieses Vorschlages gleich erkannten. Einige aber hielten sich fern und meinten, dies könnte nicht ausgeführt werden und werde auch nie geschehen. Heute giebt es, wie ich glaube, in Amerika, niemanden, der sich dem Studium des Kindes widmet und nicht einsähe, dass dieses Studium den anderen wissenschaftlichen Disciplinen gegenüber immer selbständiger wird. Dass dies der Fall ist, geht deutlich aus einer ganz neuen Studie hervor, welche Miss Wiltse[7] über diese Bewegung in Amerika geschrieben hat. Da heisst es: „Die Curse, welche das Studium des Kindes betreffen, sind jetzt entweder in den regelmässigen Arbeitsplan der Universitäten aufgenommen worden oder werden in den Sommersitzungen abgehalten, wie in der Clark-Universität, in Yale, Harvard, Princeton, Pennsylvania und an anderen Orten. Specialisten studiren jetzt in diesem Lande und in Europa, welche hoffen, Professoren der „Paidologie" zu werden, wenn die gegenwärtigen umgestaltenden Einflüsse dieses Studiums auf diejenigen Disciplinen, welchen die menschliche Seele Gegenstand der Erforschung ist, sich als nachhaltiger und erfolgreicher werden erwiesen haben."

Es giebt in Amerika viele Forscher auf diesem Gebiete. G. Stanley Hall[8] gebührt der Ruhm, dieses Studium*) dort eingeführt und am meisten für seine Förderung gethan zu haben. „The Pedagogical Seminary"[5,12] und „The American

*) Cf. Hon. W. T. Harris: „Editor's Preface" in der amerikanischen Übersetzung von Preyer's „Infant Mind".

Journal of Psychology"[511], von welchen er der Herausgeber ist, veröffentlichen die Ergebnisse der Arbeit in der Clark-Universität und bringen auch einige Mittheilungen über das, was in dieser Richtung in der ganzen Welt geschieht*). Zu den Professoren und Studenten, die in dieser Universität gearbeitet und Abhandlungen aus dem Gebiete des Studiums der Kinder in jenen Monatsschriften veröffentlicht haben, gehören Boas[372], Burnham[1], Donaldson[37], Scripture[503], Bryon[280], Sanford[331], West[491], Tracy[338], Dresslar[194], Bolton[219], Daniels[105], Hancock[283], Hoyl[275], Johnson[310], Yoder[505], Luckey[172], Chrisman[178]. L. N. Wilson, Clerk von der Clark-Universität, stellt eine sehr werthvolle Bibliographie über das Studium des Kindes zusammen.

G. Stanley Hall's Verdienst ist es auch, durchgesetzt zu haben, dass das Studium des Kindes als eine ordentliche Sektion der „National Educational Association" anerkannt wurde. Von dieser Vereinigung sind mehrere staatliche Gesellschaften ausgegangen, von welchen „The Illinois Society for Child-Study" (Parker[458], der Präsident, und Van Liew[471], der Secretär und Schatzmeister) vielleicht am bekanntesten ist. Eine grosse Zukunft scheint auf diesem Gebiete „The Association of Collegiate Alumni" zu haben, welche eine Section „for the Study of the Development of Children" enthält. Mrs. Annie Howe Barus[438], Washington, D. C., ist Vorsitzende dieser Sektion, und der Ausschuss hat ein Zirkular mit Richtlinien für das Studium der Kinder herausgegeben. Eine sehr erfreuliche Notiz findet sich in diesem Zirkular: „Professor Preyer, an der Universität Berlin, die erste Autorität auf diesem Gebiete, hat sich erboten, alle sechs Monate Listen von Beobachtungen, welche den Instruktionen gemäss gemacht sind, zu untersuchen und zurückzugeben ..... diese Listen sollen ihm von dem Ausschuss zugeschickt werden; es empfiehlt sich, dass möglichst viele Beobachter von diesem Anerbieten Gebrauch machen."

*) Cf. The Pedagoical Seminary, III, 1, S. 5.

Die bedeutendste pädagogische Monatsschrift in America, „Educational Review“ [510], ist voller Interesse für diesen Gegenstand. Von allen Zeitschriften muss man sagen, dass sie zahlreiche Abhandlungen aus diesem Gebiete bringen. Die verschiedenen Erziehungs- und wissenschaftlichen Gesellschaften haben auf jeder Versammlung die Abhandlung über das Studium der Kinder vor sich. Das ganze Land ist erfüllt von diesen Ideeen.

So viele Forscher arbeiten an diesem Werke, dass sie hier nur kurz erwähnt werden können. Auf medizinischer Seite finden sich unter zahlreichen Namen: Jacobi [194], Minot [94] Choppell [111], Keating [150], Tuley [108], Halsted [118], Segium [47], der ein vorzügliches Buch über Defekte geschrieben hat. Auch Kerlin [45] und Fernold [40] haben über solche geschrieben. Die Spiele etc. der Kinder behandeln Newell [312], Bolton [306], Johnson [367], Chadwick [307]. Joung [138] hat eine gute Uebersicht über die hygienische Seite gegeben. Russell [464] hat zur Beobachtung der Kinder eine so gute Methode ausgearbeitet, dass man sie nach ihm „The Russell Method“ genannt hat. Miss Laing [458] hat über ihre Arbeit an den Zöglingen berichtet. Das Wachsthum und die Entwickelung der Kinder behandeln: Bowditch [375], Peckham [399], Greenwood [385], Boas [378], Gihon [384], Porter [405], Hall [387]; das Gehör Sexton [188], Worrell [193], Miss Wiltse [192]. Auf psychologischem Gebiete sind Baldwin [206], Brown [217], Jastrow [232], Tracy [285], Scripture [245], Cattell [476], Krohn [239] zu nennen. Ueber die Sprache des Kindes liegt eine reiche Literatur vor; wir nennen nur Haldemann [321], Holden [322], Humphreys [328], Hale [360], Dewey [318], Kirkpatrick [325], Miss Warren [352], Hale [363], Chrisman [362]. Ueber das Leben der Indianerkinder haben Dorsey [28], Chamberlain [20], Fewkes [24], Miss Fletcher [25] Beobachtungen niedergelegt. Besonders beachtenswert ist das Werk Barnes [259—303], da er mit zu den Pfadfindern auf unserem Gebiete gehört und eine grosse Summe von Material gesammelt hat. Schon vor länger als einem Jahre konnte er über das, was in seinem Departe-

ment (Pädagogik) gearbeitet worden ist, berichten*): „Wir haben 6000 Kinder in Oakland gemessen und die Ergebnisse miteinander verglichen; mehr als 15000 Bilder, von den Kindern angefertigt, sind miteinander verglichen worden, 1200 Kinder sind in Bezug auf Unterscheidung und Verbindung der Farben untersucht worden; 37000 Definitionen von Kindern sind in Tabellen gebracht worden, indem man den Vorschlägen Binets folgte; mehr als 1000 Abhandlungen, den theologischen Glauben betreffend, sind untersucht worden, wobei man die Verallgemeinerungen ausarbeitete; 2500 Abhandlungen über frühe historische Begriffe sind ausgearbeitet worden, und die doppelte Anzahl solcher, die sich auf Gegenstände blosser Beobachtungen, Verallgemeinerungen und Schlussfolgerungen beziehen; 3000 Beschreibungen von Fällen, wo Kinder ungerechte Bestrafungen erlitten, und noch einmal so viele, wo sie gerecht bestraft wurden; es wurden 6000 Abhandlungen gesammelt über die besonderen Phasen der Rechte, welche die Kinder an sich selbst wahrnehmen; und 2000 Abhandlungen über die Furcht der Kinder. Ausserdem liegt eine sehr grosse Masse von Material vor über die Spiele, den Aberglauben, den Formensinn, die Entwickelung der Idee des Geschlechts, die Poesie, und die eingebildeten Gefährten der Kinder. Dieses Material ist zum Theile mit Erklärungen versehen." Der folgende Auszug aus einem Brief, den ich 1894 von Herrn Prof. H. K. Wolfe[341] (von der Universität in Nebraska) empfangen habe, dürfte hier von Interesse sein: „Ich denke, dass wir vielleicht die Ehre beanspruchen dürfen, das formale Studium des Kindes in den Arbeitsplan der Universität eingeführt zu haben. Hiermit meinte ich, dass das Werk durchgeführt wird, etwa wie ein anderes nicht graduiertes Werk, und dass auch der Credit hierfür gegeben ist. Zwanzig Studenten widmen sich dem Studium in die-

*) Cf. „Child-Study, A Symposium", The Inter-State School Review, Danville, Ill. 1894, S. 225.

sem Institut, und dieses ist das dritte Jahr, dass wir hier in dieser Weise arbeiten." Dass das Kind ein für das Studium im Laboratorium geeigneter Gegenstand ist, ist von mehreren Seiten bewiesen worden, unter anderen von Miss Williams[492] und Miss Wycoff[493]. Das, was von Miss Shinn[436] geleistet worden ist, ist von grösstem Werthe für das Studium des Kindes. Die hohe Bedeutung ihres Buches geht auch aus einem Briefe hervor, welchen Herr Prof. Dr. Preyer an mich richtete, in dem er sagt; „'Notes on the Development of a Child' sollte für die deutschen Mütter übersetzt werden."

Hiermit ist ein Ueberblick über alles das gegeben worden, was auf dem Gebiete des Studiums des Kindes gearbeitet worden ist. Eine derartige geschichtliche Uebersicht vermag sehr gut die Wichtigkeit dieses Forschungsgebietes zu zeigen und uns, wie schon früher gesagt, in der Ueberzeugung zu bestärken, dass nicht viele Jahre verfliessen werden, bis die Wissenschaft des Kindes ein selbständiger, anerkannter Zweig sein wird.

System der Paidologie

Die erste Stufe der Versuche, dieses Werk im Zusammenhange darzustellen, ist ein Umriss desselben, welchen ich hier so gut wie möglich geben möchte. Dieser Umriss ist ganz und gar nicht vollkommen, weder irgendwie vollendet, noch erschöpfend, noch etwa der beste, der selbst auf dieser ersten Stufe entworfen werden könnte; aber er wird wenigstens einen Ausgangspunkt für einen systematischen Aufbau des Studiums des Kindes bilden, da der Gegenstand weiter entfaltet wird durch Festsetzung eines Centrums, um welches die verschiedenen Arbeiten, die jetzt ausgeführt werden, zu vereinigen sind, und welches zugleich die Richtung für die Arbeit der Zukunft angeben kann.

Die beiden Hauptabtheilungen des Stoffes sind: I. Das Kind in der Geschichte; II. Das Kind in der Gegenwart.

Das Kind in der Geschichte.

Dies kann eine sehr instructive Seite der Paidologie bilden, denn ein solches Studium wird uns über die Kindheit der verschiedenen Nationen der Vergangenheit aufklären und so die Vergleichung und Gegenüberstellung der alten Völker unter einander, wie auch dieser Völker mit der Gegenwart ermöglichen. Von da aus kann die Gegenwart in vielen Punkten erhellt, eine bedeutende Hülfe für Pflege und Erziehung des Kindes gewonnen werden. Dieses Studium wird die Erziehung und das Heranwachsen, die Bildung, die Beziehung

des Kindes zu den Eltern, zum Staate, zur Gesellschaft und zur Religion, ferner Kleidung, Speise etc. etc. mit berücksichtigen. Es wird sich beschäftigen mit dem Kinde in den alten Kulturländern Africas und Asiens: Egypten, Carthago, Indien, China, Japan, Assyrien, Persien, Judäa, Arabien; ferner Europas: Griechenland, Italien, Deutschland, Gallien, England und andere Länder; Americas: das alte Peru und Mexico. Es wird das Kind in den mittelalterlichen Zeiten Europas und in den folgenden Jahrhunderten studiren und fortschreiten bis zur Gegenwart. In America wird das Studium des Kindes unter den früheren Ansiedlern — Spaniern, Franzosen, Deutschen, Holländern, Cavalieren, Puritanern, Quäkern, Katholiken, Baptisten — gewiss viel Neues zu Tage bringen. Die Cultur-Geschichte muss vollständig durchsucht werden, damit die Materialien für diese Abtheilung zum Vorschein kommen.

Das Kind in der Gegenwart.

Dies wird die Materien umfassen, die bei den verschiedenen Völkern gegenwärtig in ihrer Beziehung zum Kinde gefunden werden. Es zerfällt in zwei Abtheilungen: 1. Das Kind unter uncivilisirten und halbcivilisirten Völkern; 2. Das Kind unter civilisirten Völkern.

Das Kind unter uncivilisirten und halbcivilisirten Völkern.

Dies ist ein sehr ausgedehntes Feld, und doch wurde bis jetzt nur wenig Material zusammengetragen. Reisende und Völkerkundige haben in ihren Schriften viele Thatsachen niedergelegt, die trefflichen Stoff für den Aufbau dieses Theils der Paidologie liefern. Hier soll nicht versucht werden, ihn im Umrisse darzustellen, sondern nur einige für die künftige vergleichende Paidologie wichtige Punkte seien angegeben, z. B.: Spiele, Lieder, Sport, Spielsachen; ferner Sorge für die Kinder und Schutz derselben, die Art, wie die Mutter ihr Kind trägt; Wiege, Geh-

körbe, Kinderstühle; das Kleid des Kindes; die Beziehung des Kindes zum Vater, zu der Mutter, zu den anderen Gliedern der Familie; die Gemüthsstimmung der Eltern gegenüber dem Kinde, der Kindesmord; die Geburt und der Tod und der Eintritt der Reife des Kindes; Gesellschaften zugunsten der Kinder, Circumcision, Insibulation des Kindes; Kindermythen etc.

Das Kind unter civilisirten Völkern.

Dies enthält zunächst die das Kind betreffenden praktischen Lebensinteressen. Sie erfordern eine Zweitheilung: 1. Das abnorme Kind; 2. Das normale Kind.

Das abnorme Kind.

Das Wort abnorm bezeichnet alle Kinder, die ausserhalb der gewöhnlichen Ordnung der Kinder stehen. Es wird hier nicht im strengen Wortsinn, sondern als einfacher Terminus zum Zweck der Classification gebraucht. Von den abnormen Kindern sind namentlich zu beachten: 1. Die Mangelhaften; 2. Die Delinquenten; 3. Die Abhängigen; 4. Die Verwilderten; 5. Die Aussergewöhnlichen.

Die Mangelhaften. — In dieser Klasse sind zu verzeichnen: Der Blinde, der Taubstumme, der Taubstummblinde, der Geisteskranke, der Geistesschwache (der Blödsinnige, der Imbecille, der Irre), der Apathische, der Krüppel u. a. Auf diesem ungemein grossen Gebiete ist bereits viel und sorgfältig von Ärzten gearbeitet. Für den Paidologen wird es immer eine reiche Fundgrube sein.

Die Delinquenten. — In diese Gruppe gehören die zu Strafhandlungen gekommenen Kinder, sowie diejenigen, welche durch ihre Verhältnisse leicht zu Strafhandlungen geführt werden können. Gerade gegenwärtig wird von der Erforschung solcher Fälle viel erwartet. Die merkwürdigen Wandlungen in der Behandlung der strafbaren Kinder und die Mittel, die angewendet werden, diese zu retten, eröffnen

der Paidologie eine Phase des Kindeslebens, die besonders sociologisch wichtige Entdeckungen verspricht.

Die Abhängigen. — In diese Klasse werden gestellt: Waisen, Findlinge, vernachlässigte Kinder und alle solche, welche die Aufmerksamkeit der Gesellschaft, des Staats, der Gemeinde und der Kirche nöthig haben. Unter diesem Gesichtspunkte wird auch die gewerbliche Kinderarbeit in Betracht kommen, weil hier jene Kinder gefunden werden, die des schützenden Armes des strengen Gesetzes und der aufopfernden Liebe bedürfen, wenn ihnen geholfen werden soll. In dieser Abtheilung ist viel Material von grösster Wichtigkeit für die Menschheit zu finden.

Die Verwilderten. — Diese Klasse umschliesst diejenigen Kinder, welche, ausgesetzt von den Eltern, verloren oder verlassen oder auf sonst eine Weise von der übrigen Menschheit isolirt wurden; sie sind unter Thieren oder ganz allein aufgewachsen. Das Studium derselben ist namentlich in physiologischer und psychologischer Hinsicht (psychogenetisch) wichtig. Da aber die Nachrichten über frühere Wildlinge meistens unzuverlässig sind, und neuere zu den grössten Seltenheiten gehören, ist erst sehr wenig sicheres über dieselben ermittelt.

Die Aussergewöhnlichen. — In diese Klasse gehören alle Kinder — ausser den Normalen —, die nicht in die vorstehenden Kategorien passen. Sie umfasst den Genialen, den Stupiden (sofern er nicht schwachsinnig ist), den Neurotischen, den Choreatischen, den Rhachitischen, den Anämischen und ähnliche, welche sich durch ihre Heilbarkeit von den defekten Kindesnaturen unterscheiden. Dieser Abschnitt wird mit jenen in Schule und Gesellschaft angetroffenen Kindern zu thun haben, welche ausserhalb der Gesundheitsbreite normaler Kinder leben.

Jede Gruppe der abnormen Kinder kann unter den für Normale gegebenen Punkten studirt werden, oder unter ihren eigenen speciellen Gesichtspunkten, oder in allgemeiner Weise, je nach der Aussicht auf den besten Erfolg.

Das normale Kind.

Obgleich das Studium der vorhergehenden Abtheilungen der Paidologie von grosser Wichtigkeit und nothwendig für das vollständige Verständniss der Kindesnatur ist, dürfen wir dennoch nicht zu viel Zeit und Aufmerksamkeit darauf verwenden unter Vernachlässigung des Kindes, das beständig um uns ist. Eine solche Anziehungskraft haftet dem an, was ausserhalb unseres nächsten Bereiches und des Gewöhnlichen liegt, dass wir geneigt sind, zu vernachlässigen, was uns gewöhnlich erscheint und immer vor Augen steht. So viel auch immer von einem Studium des abnormen Kindes gewonnen werden kann, das Studium des normalen Kindes fördert ungleich mehr zu Tage. Wie sehr auch das Studium des Kindes in der Geschichte uns anzieht, oder das Verhalten der Kinder bei uncivilisirten Völkern: das Studium des normalen Kindes, wie wir es in der Gegenwart bei uns finden, ist viel wichtiger. Daher erfordert das „normale Kind" eine viel gründlichere Untersuchung, als alle übrigen Abtheilungen der Paidologie. Im Allgemeinen kann hier folgendermassen eingetheilt werden: 1. a) der Körper, b) die Seele; 2. Die Thätigkeit des Kindes; 3. Die Paidometrie; 4. Die Beobachtung; 5. Das Laboratorium; 6. Die allgemeinen Materien.

Der Körper des Kindes. — Um die höhere Seite der Kindernatur — die Seele — richtig studiren zu können, muss der Körper wohl verstanden werden. Das Kind drückt so viel mittelst seines Körpers aus, dass es nothwendig erscheint, auf ihn grosse Aufmerksamkeit zu verwenden. Daher muss der Beobachter von der Bildung, dem Wachsthum und der Entwickelung des kindlichen Körpers etwas wissen. Er muss den Körper kennen von der Gewebsbildung im Embryo an, in den verschiedenen Stadien, bis zum Mannesalter, im besonderen die somatischen Veränderungen um die Zeit der Pubertät. Damit muss ein Wissen von der Pflege des Körpers einhergehen. Der Körper des Kindes lebt in zwei ganz verschiedenen Welten: 1. Vor der Geburt; 2. Nach der Geburt.

Der Körper vor der Geburt. — Um den Körper des geborenen Kindes besser zu verstehen, ist es gut, zu wissen, wie er vor der Geburt beschaffen ist; es wird dann eine Ansicht vom Körper gebildet, welche das Studium der Seele erleichtert. Bemerkenswerthe und sehr sorgfältige Untersuchungen haben sich bekanntlich mit dieser Periode beschäftigt, und wer es versteht, ihre Resultate zu sammeln, wird als Paidolog eine wesentliche Stütze darin finden. Es ist von grossem Interesse, zu wissen, dass man so gut wie nichts über die Befruchtung des menschlichen Eies und die während der ersten drei Wochen in dem Leben des menschlichen Embryos auftretenden Änderungen weiss, und man daher für diesen Theil auf das Studium der Thiere angewiesen ist. Auch ist es von Wichtigkeit, die Entwickelung der verschiedenen Organe und ihren Zustand bei der Geburt zu kennen. Einer der bedeutendsten Züge ist hier das Verhältniss zwischen dem Grosshirn und dem Kleinhirn. In den früheren Stadien des menschlichen Embryos besitzt das Grosshirn weniger Volumen und liegt, wie in dem Embryo aller Wirbelthiere, vor den übrigen Theilen des Gehirns. Aber das Grosshirn wächst beim Menschen nach rückwärts, bis es das Kleinhirn bedeckt und viel grösser als das Kleinhirn und die übrigen Hirntheile wird und verhältnissmässig grösser ist, als bei den anderen Wirbelthieren — 78 Procent des ganzen Gehirns. Dies ist von grosser Bedeutung, weil die Aussicht besteht, dass der Höhe dieses Verhältnisses die Höhe des Bewusstseinslebens entspricht. Ich erwähne diesen einen Punkt, um zu zeigen, wie wichtig es für den Paidologen ist, sich mit den Thatsachen dieser Periode des Kindeslebens bekannt zu machen. Es sind hier viele andere wichtige Fragen zu erörtern, unter anderem die Differenzirung der Geschlechter, der Einfluss der Umgebung der Mutter auf das Kind während der Schwangerschaft, die Ursache für die Entstehung missgestalteter Kinder und der Missgeburten, der Einfluss der Erblichkeit auf Körperformen u. s. w. Das Studium der Hygiene dieser Periode sollte

von jedem Studenten sorgfältig durchgearbeitet werden, und die Bekanntschaft mit diesem Gegenstande muss jedem zur Pflicht gemacht werden, der in das Studium des Kindes eintritt. Es giebt aus dieser Periode noch sehr viel, was für den Paidologen Interesse und Werth hat.

Der Körper nach der Geburt. — Die Geburt hat wesentliche Veränderungen des kindlichen Körpers zur Folge, welche bedingt sind durch die plötzliche Änderung der ganzen Umgebung. Die Gestalt, das Wachsthum, die Athmung, die Anpassung an seine Verrichtungen und deren Art und Weise, die Pflege der verschiedenen Theile des Körpers, die Ausscheidungen und viele andere Dinge müssen beachtet werden. Im Ganzen unterscheide ich hier: 1. Die Anatomie; 2. Die Physiologie; 3. Die Hygiene.

Die Anatomie. — Diejenigen Theile des Körpers, welche bei der Geburt noch unvollständig sind, wie die Knochen, müssen in ihrer Entwickelung bis zu ihrer Vollständigkeit verfolgt werden. Die verschiedenen Theile des kindlichen Körpers muss der Paidolog kennen, und ebenso ihre Stellung und ihre Beziehungen zu einander. Das vergleichende Studium des jungen kindlichen Körpers und desjenigen des Erwachsenen, sowie älterer Kinder und junger Thiere wird ohne Zweifel für die Paidologie werthvolle Thatsachen aufdecken. Die Missbildungen müssen hier auch berücksichtigt werden, fallen jedoch zum Theil unter das Studium des abnormen Kindes, so z. B. Skoliose, Kyphose, Engbrüstigkeit, Klumpfuss, Krummbeinigkeit u. a.

Die Physiologie. — Nachdem Bau, Stellung und Beziehungen der Theile des kindlichen Körpers erlernt sind, hat das Studium der Functionen zu beginnen. Die Knochen, die Muskeln, das Herz, die Lungen, der Magen und andere Organe müssen studirt werden, damit man lerne, wie und unter welchen Bedingungen sie in richtiger Weise abwechselnd thätig sind und ruhen, und anderes mehr. Die Verbindung zwischen dem Gehirn und den anderen Theilen des Körpers, der Weg und die Art und Weise der Nerven-

leitungen und die dieselben fördernden Umstände, sind von der grössten Wichtigkeit. Es muss, soweit möglich, ermittelt werden, wie die Nahrung in Gewebe verwandelt, umgesetzt und ausgestossen wird. Die Kraft der arbeitenden Theile des kindlichen Körpers in den verschiedenen Perioden muss erforscht werden, damit keiner dieser Theile mit Arbeit überladen, und ihnen doch das nothwendige Mass von Thätigkeit gewährt werde. Die Kapacität der verschiedenen Organe, zum Beispiel die des Magens, muss dem Studenten der Paidologie bekannt sein. Die Vergleichung der Kapacitäten und Leistungen des Erwachsenen mit denen des Kindes, und zwar mit denen von Kindern verschiedenen Alters, wird von grossem Werthe sein.

Die Hygiene. — Wenn eine Erkenntniss von der Stellung, dem Baue und den Beziehungen der Theile des Körpers und auch von den Functionen, der Leistungsfähigkeit und der Arbeitsweise dieser Theile gewonnen ist, so folgt das Studium der Sorge für den Körper und die Feststellung der Bedingungen, welche am besten das Gedeihen und Wachsthum fördern und alles in gutem Gange und in guter Verfassung erhalten. Hierher gehört: die Sorgfalt der Mutter während der Schwangerschaft; die besondere Pflege und Beobachtung des Kindes bei der Geburt; die Lage und die Luft des Schlafzimmers, Art und Zahl der Decken, die Grösse des Schlafzimmers und die richtige Reinigung desselben; Qualität, Quantität und Zubereitung, sowie die Art der Aufnahme der Speisen und der Getränke; die Kleidung für die verschiedenen Altersstufen und Jahreszeiten und die Regulirung der körperlichen Bewegungen; die für die richtige Entwickelung des Körpers nothwendige Abwechslung von Arbeit und Spiel; die Reinlichkeit und der Schutz des Körpers; Wachsamkeit gegenüber schädlichen, krankmachenden, unangenehmen Gewohnheiten der Kinder in den verschiedenen Altersstufen; ein Verständniss der gewöhnlichen Kinderkrankheiten; Art und Dauer der Ansteckung durch ansteckende Krankheiten, sowie deren

Dauer und die strenge Absonderung angesteckter Kinder; die Pflege des Kindes in der Krankheit; und viele andere Materien, welche nothwendig sind, um den Organismus im gesunden Zustande zu erhalten.

Die Seele des Kindes. — Das Studium aller bis hierher aufgezählten Fächer muss betrachtet werden als Vorbereitung und Hülfsmittel für das Studium der Seele des Kindes. Diese ist für den Paidologen das Centrum, um welches alle seine Arbeit sich dreht, und das besondere Centrum wiederum in diesem allgemeinen ist der Wille, — die rechte Wahl und das richtige Handeln. Die Seele des normalen Kindes, wie sie sich unter unseren heutigen Kulturverhältnissen entwickelt, sollte vor allen anderen Dingen verstanden werden. Dass wir sehr wenig hiervon wissen, jedoch ein grosses Interesse dafür erwacht ist, ist bekannt. Je besser die Seelenthätigkeit des Kindes verstanden wird, desto sicherer kann sich die Civilisation entwickeln. Der Paidolog muss immer bedenken, dass fast jeder Theil seines Werks an und für sich von grossem Werthe und Interesse ist; nichtsdestoweniger muss er alle Theile jenen Fäden entsprechend anlegen, die zu der centralen Idee — dem Willen — hinleiten, damit er lerne, das Kind in den Stand zu setzen, zu allen Zeiten das Rechte zu denken, zu wählen und zu thun. Unter dem Rechten verstehe ich hier, was nothwendig ist, den Zweck des Daseins zu erfüllen. Jedoch muss der Paidolog berücksichtigen, dass seine Aufgabe nur besteht in der Erforschung der gegebenen Thatsachen bezüglich der Wirkungsweise derselben auf die Kindesseele und der Bedingungen, unter welchen sie am besten sich entwickeln kann. Er muss fürs Erste sich durchaus der Anweisungen an alle diejenigen enthalten, die in unmittelbarer Berührung mit dem Kinde stehen. Seine Aufgabe ist es nicht, anzuwenden, sondern zu erforschen. Die Unterabtheilungen dieses Capitels sind: 1. Die Psychologie. 2. Die Ethik. 3. Die Religion.

Die Psychologie. — In keinem Theil der Paidologie ist so viel geschehen, wie in der Psychologie, und so liegt

hier dem Paidologen bereits ein ungeheures Material vor. Dieses Thatsachenmaterial ist so umfassend und so werthvoll, dass es mit grosser Geduld und Mühe sorgfältig geordnet werden muss. Für jetzt muss ich mich mit einer sehr knappen Uebersicht begnügen und zwar nach folgenden Gesichtspunkten: 1. Die Sinne. 2. Die Erkenntniss. 3. Das Gefühl. 4. Der Wille.

Die Sinne. — Das Kind erlebt so viel durch seine Sinne, dass sie mannigfache Gelegenheit für seine Erforschung bieten. Es ist sehr vieles auf diesem Felde gethan worden, aber es bleibt weit mehr noch zu thun übrig. Der Gesichtssinn des Kindes ist von der Geburt an studirt worden, und die Ergebnisse sind von grosser Wichtigkeit. Das Gehör ist ebenfalls von der Geburt an, die verschiedenen Altersstufen hindurch, untersucht worden. Der Tastsinn wurde mehr bei kleinen Kindern, als bei grösseren studirt; hier liegt daher für den Forscher noch ein grosses Feld offen. Dem Geschmacke wurde einige Aufmerksamkeit zugewendet, aber nicht in dem Masse, wie es erforderlich wäre. Sehr wenig ist der Geruchsinn der Kinder untersucht worden. In den beiden letzten Fällen wurde viel mehr das Abnorme, als das Normale beachtet. Die Ergebnisse zeigen, dass ein sorgfältiges Studium hier noch manches aufzuklären haben wird. Der Temperatursinn, die Gemeingefühle und der Muskelsinn haben noch nicht so viel Beachtung gefunden, als es nothwendig scheint.

Die Erkenntniss. — Es sind Zweifel geäussert worden über die Anwendbarkeit der Methoden des Studiums der Erwachsenen auf das Kind. Wer sich in die Kindesnatur vertieft, erkennt, dass, obschon der Erwachsene ein ausgewachsenes Kind ist, doch das Kind kein verzwergter Erwachsener ist. Folglich muss die Thätigkeit des kindlichen Verstands ganz vom Standpunkte des Kindes, nicht aber vom Standpunkte des Erwachsenen aus betrachtet werden. Gewiss kann der Forscher sich nicht seiner persönlichen Eigenart entledigen, aber er muss sie zu Gunsten der

Wissenschaft des Kindes ebenso opfern, wie in anderen Wissenschaften. Es scheint, dass wir manche der beim Studium des Erwachsenen gewonnenen Ideeen bei Seite legen müssen, bis wir zu ihnen vom Studium des Kindes aus zurückkommen können. Wir dürfen nicht — wie ein Forscher sich ausdrückt — von der Psychologie des Erwachsenen zu derjenigen des Kindes hinabsteigen, sondern müssen von der letzteren zur ersteren aufsteigen. Die frühere Lehre, dass der Kenner der Psychologie (des Erwachsenen) ohne weiteres befähigt sei, an der Erziehung des Kindes mitzuwirken, ist nachgerade hinfällig geworden. Es mag sein, dass die reine Erkenntniss des Kindes ebenso wie die reine Erkenntniss des Erwachsenen verläuft, aber wenn wir unmittelbar die Kindesseele studiren können, wird es dann nicht am besten sein, dies zu thun, bis die Thatsachen klargestellt sind? Es sind hier viele Fragen zu beantworten; so die folgenden: Wann wird das Kind ein Wesen, das sich seiner selbst bewusst ist? Wie entfaltet sich die Seele in den verschiedenen Perioden des Kindes? Ist es wahr, dass das Kind in seiner intellectuellen Entwickelung die intellectuellen Stadien des Stammes zeigt? Giebt es eine Periode in der Entwickelung des Kindes, in der die Nachahmung oder die Neugierde oder die Einbildungskraft oder irgend eine der seelischen Thätigkeiten oder eine Gruppe von solchen das Übergewicht hat? Ist das Kind eben so fähig, über seine Wohlfahrt vernünftig zu urtheilen, wie der Erwachsene, oder in welchem Alter erwirbt das Kind einen solchen Standpunkt? Es müssen die verschiedenen Seelenthätigkeiten des Kindes sorgfältig studirt werden, so die Urtheilskraft, die Nachahmung, die Deutung des Wahrgenommenen, die Einbildungskraft, das Gedächtniss, die Neugierde u. s. w.

Das Gefühl. — Das Kind drückt seine Gemüthsbewegungen so deutlich, in einer so natürlichen Weise aus, dass für den Erforscher der Kindessele oft die reinen Acte der Seele offen daliegen. Das kleine Kind verbirgt seine rührige Natur in keiner Weise, sondern zeigt sie eben so

lebhaft, wie ein junges Thier. Das Gefühl des Kindes ist mehrfach untersucht worden, und zwar mit gutem Erfolge. Es ist genug geschehen, um zu zeigen, dass wir uns mit den einschlägigen Phänomenen näher bekannt machen müssen, um mit der Kindesseele bekannt zu werden. Jede Art des Gefühls, jeder Affect, jede Leidenschaft, wie Kummer, Liebe, Eifersucht, Schamhaftigkeit, Zorn müssen natürlich genau physiologisch untersucht werden.

Der Wille. — Vor allem bedarf der Wille des Kindes gründlicher Erforschung. Die Art, in welcher das Kind seine Wahl trifft, und der Weg der Ausführung können nur durch genaue Beobachtung des Kindes selbst gefunden werden. Unter den Erkennungszeichen des Willens ist es vor allem der Gesichtsausdruck, welcher ziemlich deutlich zu verstehen giebt, ob das Kind die Befehle und den Rath Anderer angenommen oder zurückgewiesen hat. Dann kommen die Körperbewegungen in Betracht, da das Kind von frühester Jugend an bis in das spätere Kindesalter hinein durch seinen Körper seinem Wollen unverhohlenen Ausdruck giebt. Auch muss der Wille des Kindes in seiner Beziehung zu anderen Kindern beobachtet werden. Ferner ist die Sprache des Kindes ein gutes Mittel zum Studium seines Willens, denn das Kind ist in der Regel nicht sparsam mit der Sprache, um seine Wahl und seine Bevorzugungen auszudrücken. Die Fragen nach dem Ursprunge des Willens und seinem Wachsen und andere können nur, wenn überhaupt, durch die Beobachtung des Kindes selbst beantwortet werden.

Die Ethik. — Es ist so viel ohne alle Beobachtung der Kindesnatur oder nur auf einen flüchtigen Blick hin über die Moral des Kindes geschrieben worden, dass man im ersten Augenblicke fast versucht sein könnte, die ganze, die sittliche Seite des Kindes betreffende Litteratur bei Seite zu werfen und einzig mit der Beobachtung des Kindes anzufangen. Obgleich jedoch viel von diesen Schriften werthlose Schwärmerei und auf sehr mangelhafte Vorstellungen

gegründet ist, ist immerhin hie und da Einiges von grossem Werthe. Nach dieser Seite muss der Paidolog das Material sorgfältig sichten und wieder sichten; aber viel mehr noch muss er das Kind erforschen. Es giebt hier viele Fragen, die beantwortet werden müssen, ehe wir das Kind richtig verstehen können. Einige mögen überhaupt nicht zu beantworten sein, allein keiner von ihnen können wir näher treten, ausser durch ein gründliches Studium des Kindes; z. B.: Zeigt das Kind zu irgend einer Zeit, dass es sittliche Ideeen besitzt, welche ihm nicht durch die Eltern oder sonst jemanden unmittelbar eingepflanzt sind? Was erscheint dem Kinde als Recht, und was als Unrecht? Unter welchen Bedingungen beweist das Kind wahren Gehorsam? Ist es von Haus aus moralisch oder unmoralisch? Ist es ursprünglich immer ein selbstisches (egoistisches) Wesen?

Die Religion. — Es ist bekannt, wie wenig wir von der religiösen Empfänglichkeit des Kindes wissen. Dieses Wenige hat uns eine neue Welt geoffenbart. Der Glaube eines Volkes ist eine heilige Sache; aber die Glückseligkeit und die Wohlfahrt des Kindes muss uns wichtiger sein, als die Betrachtung jener Dinge, welche nur ihres Alters wegen heilig sind. Der Forscher wird in dieser Richtung kühn genug sein müssen, alle Vorurtheile beiseite zu legen und in diese Arbeit einzutreten, einfach um zu lernen, was das Kind aus sich heraus zu entwickeln vermag. Dieses gilt eben so wohl für jene, welche die bestehenden Religionen bekämpfen, als für jene, welche dieselben verehren. Die Erkundigungen über die religiöse Natur des Kindes erfordern die sorgfältigste Aufmerksamkeit, denn von solchen Erkundigungen hängt das künftige Glück des Kindes, wie des Menschengeschlechts ab. Es ist ungemein schwer, ja fast unmöglich, möchte man sagen, die Vorurtheile von dieser Frage fern zu halten. Aber dieses Werk muss in der kühlsten wissenschaftlichen Weise gethan, es dürfen hier keine bestehenden Theorieen oder Neigungen unterstützt werden. Die Frage der Religion scheint eine von jeder

anderen so verschiedene Stellung zu haben, dass die Erforschung derselben beim Kinde sehr vorsichtig aufgenommen werden muss. Ich fühle, dass angesichts dieser Nothwendigkeit der Forscher sich vor dem Versuche hüten muss, seine Ergebnisse auf Gebiete anzuwenden, welche ausserhalb seines speziellen Faches liegen. In diesem besonderen Felde sollte er darauf halten, seinen Gegenstand einzig vom wissenschaftlichen Standpunkte aus anzusehen, die Anwendung seiner Resultate denjenigen überlassend, deren Aufgabe eben diese Anwendung ist. Es sind einfach die nackten Thatsachen und die daraus sich ergebenden Resultate mitzutheilen. Einige der vielen hierher gehörigen Fragen sind: Zeigt das kleine Kind, dass es eine religiöse Natur besitzt? Wie nimmt das Kind die religiöse Unterweisung auf, und wie giebt es dieselbe wieder? Bildet das Kind seine frühen religiösen Vorstellungen unmittelbar aus sinnlichen Anschauungen? Um welche Zeit zeigt sich seine Fähigkeit, diese Vorstellungen als abstracte zu betrachten? Ist dem Kinde eine Periode des Zweifels von Natur eigen, oder ist dieser Zweifel von der Erkenntniss hervorgebracht, dass im früheren Unterrichte Aufgenommenes falsch und unmöglich sei? Giebt es thatsächlich eine „Sturm- und Drang-Periode", in welcher das ganze Wissen, Meinen, Glauben, Fühlen des Kindes hin- und hergeworfen wird zwischen Beängstigungen, Furcht und Zweifel? Welches sind die beginnenden Symptome derselben? wie verläuft diese Periode? wie überwindet sie das Kind? wann beginnt diese Zeit? und wie lange dauert sie?

Die Thätigkeit des Kindes. — Die hier zu betrachtenden Gesichtspunkte hätten wohl auch den anderen Abtheilungen unterstellt werden können; aber diese Seite der Kindesnatur ist von so grosser Wichtigkeit, dass es nothwendig erscheint, einen besonderen Abschnitt hierfür einzurichten und demselben specielle Aufmerksamkeit zu widmen. Auf keine Weise kann am Kinde besser gelernt werden, als durch ein richtiges Studium jener Dinge, welche

es, weder angeregt noch gehindert durch Erwachsene, thut, — ein Studium, welches das kindliche Thun und die Erfolge desselben für das Kind selbst beobachtet. Unter den verschiedenen Dingen, die hierher zu stellen sind, wähle ich die folgenden aus, welche am besten erläutern, was hierher gehört: 1. Die Spiele und Lieder; 2. Die Sprache; 3. Die Sammlungen; 4. Die Manufacturen; 5. Die Organisationen.

Die Spiele und Lieder. — Es ist bereits eine ansehnliche Arbeit auf diesem Felde gethan worden, mit welcher der Paidolog sich bekannt machen muss. Es gilt zu erklären, warum die Kinder an Spielen und Liedern die grösste Freude haben. Auch kann hierbei beobachtet werden, wie die Kinder sich selbst controlliren, wenn sie nicht unter dem Einflusse der Erwachsenen stehen. Die gesellschaftliche Seite des Kindeslebens liegt hier deutlich vor uns. Vieles wird zu lernen sein aus diesen freiwilligen Handlungen der Kinder.

Die Sprache. — Es giebt zum wenigsten dreierlei Kindersprachen. Die erste ist die Muttersprache. Es liegt eine grosse Menge von trefflichen Untersuchungen über deren Erlangung vor, welche den Forschungen des Paidologen zur Grundlage dienen können. Jedes Kind durchläuft diese Periode, sodass eine Fülle von Gelegenheiten für das Studium derselben geboten ist. Die zweite Phase der Kindersprache tritt in den frühen Jahren ein, um die Zeit der Erlernung der Muttersprache. Es ist eine Sprache, die von den Kindern erzeugt ist, welche bei ihren Anstrengungen, sprechen zu lernen, vielleicht nicht fähig sind, die Schwierigkeiten der Muttersprache zu bemeistern, — eine Sprache in eigenen Ausdrücken, welche dem Kinde leichter von der Zunge fliessen. Dies ist nicht die Sprache der defekten Kindesnaturen, denn die Muttersprache wird von ihnen im späteren Leben erlernt und gebraucht, während die selbstgemachte Sprache verschwindet. So weit ich die Sache überblicke, ist sehr wenig auf diese Art der Kindersprache geachtet worden; immerhin ist ihre Wichtigkeit er-

wiesen. Diese zweite Form der Sprache ist vielleicht unwillkürlich und unbewusst gebildet, während die dritte Art ganz willkürlich erzeugt ist: die Geheimsprachen, welche selten vor dem achten Jahre auftreten und nach dem fünfzehnten Jahre gewöhnlich verschwinden. Auch diese Thatsache hat bis jetzt nur sehr geringe Beachtung gefunden. Nicht zu vergessen ist endlich die Untersuchung des Schreiens und des Schreiweinens der Kinder.

Die Sammlungen. — Die Dinge, mit welchen das Kind sich umgiebt, zeigen, in welchen Richtungen sich sein Gedankenkreis bewegt. Ich verstehe darunter nicht nur die sonderbaren Dinge, welche es sammelt, sondern auch die gewöhnlichen, die es um sich zusammenträgt. Ein Verzeichniss der Dinge, die das Kind in den verschiedenen Altersperioden sammelt, wäre sehr instructiv.

Die Manufacturen. — Die Dinge, welche das Kind fabricirt, die Art seines Arbeitens an denselben, das Denken und die Aufmerksamkeit, welche es darauf verwendet, zeigen deutlich einen Weg zur Erkenntniss der Individualität und der Neigungen des Kindes. Es scheint mir, dass, könnten wir uns speciell der Beobachtung des allein arbeitenden Kindes widmen und dann die Dinge untersuchen, die es macht, auf keine Weise die Natur jenes Kindes besser erforscht werden könnte. Wenn jeder, der gefunden hat, wo seine Kraft und seine beste Art, zu arbeiten, liegt, auf seine Kindheit zurücksieht und sich selbst betrachtet, wie er seine Waaren fabricirte, ehrgeizig, eifrig zu Werke ging, wird er, dessen bin ich sicher, sein treues Selbst, wie es sich jetzt entfaltet hat, in den einfachen Arbeiten der Kindheit wiederfinden. Die besten Kräfte, die er damals zeigte, sind jene, welche durch die Noth wachgerufen wurden und jetzt am klarsten hervortreten. Oder sollte ich irren? Dieses Feld muss jedenfalls bebaut werden, wenn wir die wahre Natur des einzelnen Kindes kennen lernen wollen. Auch kann die Untersuchung der kindlichen Constructionen u. s. w. zu nützlichen Erfindungen führen, denn bereits haben Kinder der

Welt zu einigen der nützlichsten Erfindungen verholfen, zum wenigstens wird es sich lohnen, die Kinder zu selbständigem Suchen zu ermuthigen. Auch kann die Entfaltung der erfinderischen Gaben im Kinde die Entwickelung derselben im ganzen Geschlechte erhellen.

Die Organisationen. — Welch ein ausgedehntes Gebiet liegt hier offen für den Paidologen! Man sollte kaum denken, dass z. B. alle Formen der Regierung aus den organisatorischen Versuchen und Entwürfen des Kindes dargestellt werden können. Es ist gewiss, dass, wenn dieser Zug des Kindeslebens untersucht sein wird — die einfachsten Einrichtungen der kleinen Kinder beim Spiel und bei der Arbeit, ebenso wie die in Schule, Kirche und Gesellschaft hervortretenden — viele für die socialen Einrichtungen der Erwachsenen nützliche Ideeen zu Tage treten werden; — sogar unsere Regierungen können daraus lernen.

Die Paidometrie. — In diese Abtheilung, welche nicht etwa ein Anhang zur Anthropometrie ist, gehören diejenigen den kindlichen Körper betreffenden Beobachtungen und Messungen, welche eine hervorragende Bedeutung für die Erforschung der Seele haben. Sie betrachtet das Allgemeinbefinden und die Gesundheit des Kindes und kann der Betrachtung der Gesichtsbildung, der Haut, der Muskeln, des Körpers überhaupt, einen grossen Raum geben. Die Körperlänge und das Gewicht der Kinder verschiedener Altersstufen und beider Geschlechter, sowie die Beziehungen zwischen Länge und Gewicht werden hier zur Sprache kommen, und damit die allgemeine Muskelentwickelung, -kraft und -ausdauer. Die Messungen des Kopfumfanges, des Antlitzes, verschiedener anderer Theile des Körpers sind wichtig. Die vitale Capacität — d. h. die äussersten Differenzen des Brustumfangs bei tiefer Ein- und Ausathmung —, die Farbe des Haares, der Augen und der Haut u. v. a. gehören hierher. Der Gesichtssinn (Sehschärfe, Farbenblindheit), das Gehör, der Tastsinn, der Geschmack, der Geruch, die allgemeine Empfindlichkeit und die Empfind-

lichkeit gegen Schmerz bilden besonders wichtige Unterabtheilungen.

Die Beobachtung. — Gegenwärtig gründet man den Haupttheil des Studiums des Kindes auf die Beobachtung. Einiges höchst werthvolle ist hier geleistet worden und eröffnet die besten Aussichten für Künftiges. Da hierbei vieles durch die Eltern und andere gethan werden kann und wissenschaftliche Vorbildung nicht voraussetzt, bleibt für den Paidologen hauptsächlich die Aufgabe, Material zu sammeln, alle Angaben kritisch zu prüfen, statistisch zu verwerthen und die Beobachtungen richtig zu leiten. Er muss sich mit dem bereits Geleisteten und den gegenwärtigen Untersuchungen bekannt machen und dabei lernen, nach den besten Methoden zu verfahren. Zwei Richtungen der Betrachtung des einzelnen Kindes einerseits und des Kindes im allgemeinen andererseits müssen unterschieden werden. Beide sind sehr erfolgreich in Angriff genommen worden. So haben wir die Abtheilungen:

1. Das individuelleKind.
2. Die Kinder im Ganzen.

Die Beobachtung des individuellen (einzelnen) Kindes kann ganz im Allgemeinen oder nach einigen besonderen Gesichtspunkten vorgenommen werden. Im ersten Falle werden Thatsachen aus dem Leben des Kindes, wie sie gerade vorkommen, ohne Bevorzugung einzelner registrirt. Diese Beobachtungen können täglich oder wöchentlich oder von Zeit zu Zeit nach dem Gutdünken des Beobachters geschehen. Im zweiten Falle sucht der Beobachter einzelne Züge zu erfassen. Hier besteht, welches auch immer der Gegenstand des Spezialstudiums sei, nur die Absicht einer durchgehenden Darstellung eben dieser einen Seite, und so kommt hier nur in Betracht, was sich unmittelbar darauf bezieht. Bis zu einem gewissen Grade können beide Methoden — die allgemeine und die besondere — verbunden werden, aber alle, die sich mit dem Studium eines Kindes befasst haben, werden zugeben, dass es

nahezu die ganze Arbeitszeit in Anspruch nimmt, es glücklich durchzuführen. Doch lohnt es reichlich alle darauf verwendete Zeit. Einige sehr schätzbare Studien über einzelne Kinder sind bereits herausgegeben worden.

Die Beobachtung des Kindes im Ganzen, — ebenfalls eine allgemeine und eine besondere. Die allgemeine Methode besteht in der Beobachtung vieler Kinder, zu irgend welcher Zeit und unter was für Bedingungen man sie gerade findet. Zu irgend einer Zeit, in welcher der Beobachter einem Kinde begegnet, kann er notiren, was er bemerkt. Es ist viel von solchen Notizen zu erwarten, denn sie betreffen die Handlungen der Kinder in den freiesten Augenblicken und unter den verschiedensten Bedingungen, und vieles kann auf keinem anderen Wege festgestellt werden. Jedermann, der in irgend einer Richtung forscht, weiss, dass ihm oft, in nicht vermutheten Augenblicken, viele der besten Gedanken einfallen, und viele zu seinem Werke gehörige Dinge begegnen; so ist es auch mit dieser allgemeinen Beobachtung des Kindes, bei der man nicht selten in günstigen Augenblicken sehr schätzbares Material findet, welches dann sofort oder nie aufgezeichnet wird. Einiges sehr treffliche ist in dieser Richtung geleistet worden. Eine besondere Aufgabe wäre hier die Durchführung der Beobachtungen nach einer speciellen Richtung, so mit Rücksicht auf Furcht oder Einbildungskraft oder Zorn und dergleichen. Dieses kann geschehen durch consequentes Notiren der Wahrnehmungen über die eine Sache, so oft wir derselben beim Kinde begegnen, oder durch Fragenstellen und Kritik der erhaltenen Antworten, oder durch Prüfung der Leistungen des Kindes, während es unter dem Einflusse der studirten psychischen (geistigen) Verhältnisse steht, oder durch Beobachtung der Sprache des Kindes, und auf mancherlei andere Weise. Diese Arbeit kann vom Paidologen selbst gethan werden, oder er kann mittelst Fragebogen Andere zu solchen Beobachtungen anleiten, welche letztere er dann zusammenfasst

und verarbeitet. In dieser Hinsicht ist neuerdings ein sehr ausgedehntes Studium begonnen worden. Viele Aufzeichnungen sind vorbereitet und herausgegeben worden. — Dieses scheint das Wesentlichste zu sein, was gegenwärtig in dieser Sache betrieben wird. Hier kann auch die Selbstbeobachtung hinzutreten, soweit sie mit Hülfe unseres Gedächtnisses möglich ist.

Das Laboratorium. — Es sind so viele Punkte beim Studium des Kindes zu beachten, dass zur Durchführung des Werkes viele Wege ersonnen werden müssen. Ich glaube, es wird Jedermann mit mir darin einig sein, dass kein besserer Plan angelegt werden kann, und keine besseren oder sicheren Ergebnisse erhalten werden können, als durch die Methode der Arbeit im Laboratorium. Für ein rein wissenschaftliches, messendes Studium kann es keine bessere, als diese, geben. Die Untersuchungen im Laboratorium sind für andere Forschungen eine Haupthülfe gewesen, sie zu Wissenschaften zu erheben, und so werden dieselben der Wissenschaft des Kindes auch solche Hülfe leisten. Besser als auf jedem anderen Wege kann im Laboratorium der Student gelehrt werden, wie das Kind zu studiren ist. Ich habe genug in dieser Hinsicht gearbeitet, um zu wissen, dass für dieses Studium ein sehr guter Grund in einem Laboratorium gelegt werden kann, wie es auch in der Physik oder Chemie oder Psychologie u. a. Brauch ist. In einer Stadt, wo sich gute Gelegenheit bietet, kann ein solches Werk bei der Geburt des Kindes begonnen und durch die verschiedenen Altersstufen fortgesetzt werden. Für sehr junge Kinder kann dieses Werk in den Hospitälern ähnlich, wie die Arbeit in Kliniken, angelegt werden. Mit den älteren Kindern kann es in dem paidologischen Laboratorium auf der Universität seine Fortsetzung erhalten. Es ist kaum nothwendig, zu erklären, dass für die Kinder kein Versuch unangenehm oder gar schädlich sein darf. Wie in anderen Laboratorien, giebt es auch hier eine allgemeine oder elementare und eine besondere Methode.

Das allgemeine Arbeiten im Laboratorium. — Ebenso, wie es z. B. für den Studenten der Chemie nothwendig ist, zunächst einleitende Studien und Arbeiten im Laboratorium zu erledigen, bevor er zu den höheren und schwierigeren quantitativen vorrücken kann, muss der Student der Paidologie einen einleitenden Curs in dem paidologischen Laboratorium durchmachen, bevor er die schwierigen Fragen in Angriff nehmen oder die Forschungen für sich betreiben kann. Dieser allgemeine Curs muss so eingerichtet werden, dass er dem Studenten eine allgemeine Einsicht in die Kindesnatur verleiht. Es muss mit dem Kinde bei der Geburt oder doch in der frühesten Periode angefangen werden, die erreicht werden kann, und das Studium muss soweit wie möglich, sogar bis zum Mannesalter fortgeführt werden. In Folge der Studien, welche ich in dieser Richtung am Kinde, von seiner Geburt an, gemacht habe, habe ich eine Liste von mehr als 200 Nummern für einen solchen Curs aufgestellt, welche, wie ich glaube, mit grossem Nutzen verwendet werden kann. Ich bin überzeugt, dass es einst zur Einführung eines Laboratoriumcurses in die Paidologie kommen wird, und dass sie sich darin mit anderen Wissenschaften sehr wohl wird vergleichen können.

Die speciellen Arbeiten im Laboratorium. — Diese sind für den älteren Studenten bestimmt. Nachdem der Student in dem Elementarcurse sich in den Feststellungen geübt und sich in allgemeiner Weise mit dem Wesen des Kindes bekannt gemacht hat, ist er darauf vorbereitet, besondere Untersuchungen vornehmen zu können. Ich kann mir keinen anderen Gegenstand denken, der mehr Material für besondere Untersuchungen geben wird, als das Kind. Diese Untersuchungen sind nicht nur selbst wissenschaftlich werthvoll, sondern auch praktisch, weil immer der Gegenstand selbst — das Kind — zur Hand ist, dem sie nützen; und ein Nutzen für das Kind ist zugleich ein Nutzen für alle. Diese Anwendbarkeit der Ergebnisse der Arbeiten aus dem paidologischen Laboratorium ist von hervorragender Wich-

tigkeit. Gleich den Laboratorien der anderen Wissenschaften wird auch das paidologische Laboratorium eine werthvolle Hülfe für die Erreichung der menschlichen Ziele bilden.

Die allgemeinen Materien. — Nach Skizzierung dieser Umrisse finde ich einige die Kinder betreffende Fragen, die, obgleich wichtig, doch sich nicht zwanglos in die obigen Abtheilungen eingliedern; daher seien sie hier zusammengestellt. Es sind namentlich fünf Punkte zu betrachten:

1. Das Kind in der Literatur.
2. Die Mythen in Rücksicht auf die Kinder.
3. Das geheimnissvolle Verschwinden von Kindern.
4. Das Wunderkind.
5. Die Gesetzgebung in Beziehung auf das Kind.

Das Kind in der Literatur. — Wie erscheint das Kind in der Literatur der verschiedenen Perioden? Einige Romanschreiber dieses Jahrhunderts haben sehr gute Beschreibungen des Kindes gegeben. Ich habe Dickens gelesen, gerade um zu sehen, wie er die Kinder darstellt; und obgleich ich seine Schriften immer bewundert und mit Genuss gelesen habe, habe ich doch seine Schilderungen nie so hoch geschätzt, wie bei dieser Lektüre, wo seine Knaben und Mädchen so lebensfrisch hervortreten. Longfellow ist der wahre Dichter des Kindes. Fast der wirklichen Beobachtung gleichgestellt muss die Darstellung werden, die ein solcher Meister der Beobachtung und Schilderung von dem Kinde entwirft.

Die Mythen in Rücksicht auf die Kinder. — Eine sehr grosse Zahl der schönsten Mythen beschäftigt sich mit den Kindern. Mehrere derselben erscheinen vielen so heilig, als ob sie himmlischen Ursprungs wären. In einigen Orten sind solche Mythen fast zur Wirklichkeit geworden. Einige sind in schöne Verse, andere in liebenswürdige Märchen gekleidet, welche sie noch mehr zum Gegenstande unseres Entzückens machen. Ihre Sammlung durch eine Meisterhand wird einst alle ihre Schönheiten offenbaren,

wie Grimm's Märchen uns zahlreiche Schätze erschlossen haben.

Das geheimnissvolle Verschwinden von Kindern. — Gegenwärtig sind Angaben über ein geheimnissvolles Verschwinden Erwachsener nichts neues mehr, aber so viel ich weiss, ist in dieser Hinsicht nichts über die Kinder ermittelt. Jedermann kennt wunderbare Erzählungen vom geheimnissvollen Verschwinden der Kinder, sodass Material vorhanden zu sein scheint, welches werth ist, gesammelt zu werden. Ich meine nicht so sehr wunderbare Episoden, als vielmehr das unbemerkte Verschwinden junger Leute, etwa um das Alter, in welchen die grossen Ansprüche des Lebens auf sie eindringen. Ob sich hier so schlagende Züge finden, wie in einigen Fällen von Erwachsenen, bleibt einstweilen dahingestellt.

Das Wunderkind. — Ob die Kindheit der Genies in irgend einer Hinsicht ganz verschieden von der Kindheit Anderer ist oder nicht, mag fraglich sein, aber ein Jeder weiss, dass es Fälle von merkwürdigen in der Kindheit hervortretenden Talenten giebt. Die Untersuchung solcher Fälle wird von hervorragendem Nutzen für das Verständniss der Kindesnatur sein, durch ihre Vergleichung mit dem gewöhnlichen Kinde.

Die Gesetzgebung in Beziehung auf die Kinder. — Die Wissenschaft des Kindes kann nicht vollständig sein, ehe sie durch ein Capitel über die der Controlle des Kindes und der Sorge für dasselbe gewidmeten Gesetze bereichert ist. Dass wir in grosser Unwissenheit hierüber sind, wird Niemand leugnen. Viele gute Gesetze, die geltend gemacht werden sollten, stehen nutzlos in den Büchern, weil sie denen unbekannt sind, welche die Geltendmachung derselben wünschten. Dann und wann werden wir recht sehr in Erstaunen gesetzt, wenn wir gewisse Gesetze entdecken, deren Bestehen wir nicht für möglich hielten; es erregt z. B. gegenwärtig ein grosser Staat in Nordamerika Aergerniss durch die Thatsache, dass die jungen Mädchen

ohne jeden gesetzlichen Schutz geschändet werden können, weil das Alter der Einwilligung zu niedrig festgesetzt ist; die Bezeichnung „Schutz" gleicht hier einem Spotte.

Ein paidologischer Laboratorium-Curs

Es soll uns hier der erste Theil eines Curses beschäftigen, welcher die Arbeit in einem paidologischen Laboratorium betrifft. In seiner Gesammtheit würde er eine Reihe von Arbeiten umfassen, welche, in diesem ersten Theile nämlich, mit dem Kinde bei seiner Geburt beginnen und mit ihm bis zum Mannesalter fortschreiten. Unsere Darstellung mag hier mit dem Kinde anfangen, welches drei Jahre alt oder etwas jünger ist. Sie ist insofern von keiner grossen Ausdehnung, als sie die psychologische Seite kaum berührt, welche jedoch, wie ich hoffe, später zur Geltung kommen wird. Der einleitende oder allgemeine Curs des Laboratoriums hat sich in den verschiedenen Wissenschaften als so zweckmässig bewährt, dass wir nicht umhin können, ihn in der Paidologie beizubehalten. Dieser einfache Versuch wird hoffentlich zeigen, dass ein solcher Curs eingerichtet werden kann, wenn er auch viel Zeit und mühsame Arbeit und Experimente erfordert, falls er für einigermassen vollständig gelten soll. Nur sehr wenig Neues kann meine Darstellung bieten, da ich meistens aus den Werken, welche das Kind behandeln oder verwandten Wissenschaften angehören, geschöpft habe. Dieses gilt besonders für den Abschnitt über die Beobachtung, welcher grösstentheils aus Warner's „Mental Faculty" herrührt. Leider kann ich die Nachweise nicht in jedem einzelnen Falle geben; ich hoffe jedoch, es wird den Werth meiner Arbeit kaum beinträchtigen, wenn ich die zitirten Bücher nur in einer allgemeinen Bibliographie aufführe.

Einige praktische Winke. Es ist wünschenswerth, dass unsere Arbeit in Räumlichkeiten gethan wird, die möglichst abgeschlossen gegen Störungen liegen, welche die Aufmerksamkeit des Kindes abzulenken vermöchten.

Mit kleineren Kindern in der gedachten Weise zu arbeiten, wird einige Schwierigkeiten verursachen. Die Erfahrung wird lehren, was unter solchen Umständen zu thun ist. Die Versuche müssen nach Umfang und Dauer dem Alter und dem Gesundheitszustande des Kindes angepasst werden. Bei unserer Arbeit darf nichts vorkommen, was sie behindert oder verlangsamt. Wir müssen stets daran denken, dass das kleine Kind nur für sehr kurze Zeit aufmerksam sein, und auch das grössere Kind seine Aufmerksamkeit nicht lange auf ein und dasselbe Ding konzentrieren kann. Ferner muss der Apparat in guter Ordnung und vollständig bereit für die Arbeit sein, ehe mit dem Kinde begonnen wird. Rasch und munter und ohne eine Äusserung der Ungeduld muss an dem Kinde experimentirt werden. Der Forscher muss von der Überzeugung getragen sein, dass der Gegenstand, mit welchem er sich beschäftigt, der feinste und zarteste ist und mehr Sorgfalt und Geduld erfordert, als irgend ein anderer.

Der Apparat. — Es ist durchaus nicht nothwendig, gerade den hier genannten Apparat zu gebrauchen, und zweifellos wird der umsichtige Lehrer, seiner Individualität und den besonderen Verhältnissen entsprechend, manchmal einen einfacheren und besseren herstellen. In vielen Fällen muss der Apparat sich erst, mit dem Fortgange unserer Arbeit, entwickeln. Folgende Instrumente sind erforderlich: Paidometer (dem Anthropometer Sergi's nachgebildet — mit einem langen Arme mit Schieber und einem Sitze und einem kleinen Arme zum Messen vom Absatze), Plattformwage, Messband, Dickzirkel, Schiebzirkel, Spirometer, Dynamometer, steifes Papier für den, welcher die Zonen des Gesichts betrachten will, Taschenuhr, Politzer's Akumeter, Galton's Pfeife, Koenig's Klangstäbe, Stimmgabeln, Resonatoren, Telegraph-snapper (cri-cri), Orgel, Harmonium oder Piano, Snellen's Sehproben, Galton's Apparat zur Prüfung der Sehschärfe, Cohn's Tafel, Pray's Buchstaben, wollenes Garn zu Versuchen über Farbenblindheit, Oliver's Apparat

zur Bestimmung des Farbensinns, Galton's Apparat zur Messung der Stärke des Stosses, Federwage.

Die Messungen

I. Der Körper. 1. Die Körperlänge. — Lass das Kind aufrecht auf dem Sitze des Paidometers stehen, ohne Schuhe, die Fersen gerade auf dem Sitze und nahe an einander geschlossen, indem sie den aufrecht stehenden Theil des Paidometers fast berühren. Bewege den kurzen Arm abwärts, bis der Kopf ihn berührt, aber nicht emporhebt. Lies die Höhe direct von der Messtafel ab.

Diese Messung kann mit den Schuhen vorgenommen werden, wenn man will. Man kann die ganze Messung auf dem Paidometer und dann die des Absatzes der Schuhe mit dem kleinen Arm des Paidometers nehmen und das letztere vom ersteren abziehen. (Es ist jedoch am besten, die Messung ohne die Schuhe vorzunehmen.)

2. Die Höhe der Schultern. — Lass das Kind auf dem Sitze des Paidometers stehen, wie bei der ersten Messung. Bewege den langen Arm, bis er ein wenig über den Schultern ist. Bewege den Schieber, auf der Seite, wo du messen willst, bis er gerade über der Schulter ist. Ziehe den Arm hinab, bis dieser Schieber auf der Schulter ruht. Lies die Höhe ab, wie vorher.

Miss die andere Schulter in derselben Weise, und vergleiche die Resultate mit einander.

Es mag gut sein, dasselbe mit dem kurzen Arm vorzunehmen. Lass das Kind so stehen, dass die gemessene Schulter und die entsprechende Hälfte des Körpers an dem Balken anliegen. Dann ziehe den kurzen Arm herab, bis er leicht auf der Schulter ruht. Lies von der Messtafel ab. Dies wird die andere Messung corrigiren oder bestätigen.

3. Die Höhe der Spitze des Mittelfingers. — Lass das Kind auf dem Sitze des Paidometers wie bei den anderen Messungen stehen. Schiebe den langen Arm, bis er unter dem Finger ist. Bewege den Schieber auf der Seite,

welche du messen willst, bis er genau unter dem Mittelfinger ist. Bewege den langen Arm des Paidometers aufwärts, bis der Mittelfinger, der ausgestreckt ist, auf dem Schieber ruht. Lies die Höhe ab, welche auf der Messtafel durch die Spitze des Schiebers angezeigt wird. Miss auf der anderen Seite in derselben Weise, und vergleiche die Ergebnisse mit einander.

4. Die Länge des Armes. — Ziehe die Höhe der Spitze des Mittelfingers von der Höhe der Schulter ab, oder

Lass das Kind auf dem Sitze des Paidometers stehen, sodass eine Seite des Körpers den aufrechtstehenden Theil berührt. Bewege die kurze Stange auf seine Schulter hinab. Bewege die lange Stange bis zu der Spitze des Mittelfingers hinauf, wie bei der letzten Messung. Die Entfernung zwischen den beiden Stangen wird die Länge des Armes des Kindes darstellen. In derselben Weise miss den andern Arm, und vergleiche die Länge der beiden Arme mit einander.

Das Ergebniss der beiden Messungen wird jeden etwa möglichen Irrthum beseitigen.

5. Die Fingerweite. — Lass das Kind auf dem Paidometer mit dem Gesicht nach dem aufrechten Stücke stehen. Bewege den langen Arm zu der Höhe seiner Schulter hinab. Lass es die Spitze seiner Mittelfinger gegen den zweiten Schieber ausstrecken und seine Arme zu der vollsten Weite ausdehnen, auf diese Weise die Schieber beiseite stossend und von einander entfernend. Die Entfernung zwischen den beiden Schiebern ist die Fingerweite.

6. Die Höhe beim Sitzen. — Lass das Kind auf dem Sitze des Paidometers, mit seinem Rücken an dem aufrechten Stücke, sitzen. Hebe die Fussstütze, bis die Kniee über die Sitzhöhe emporstehen. Bewege dann den kurzen Arm, bis er den Kopf leicht berührt, wie bei den vorhergehenden Messungen, und lies ab, wie vorher.

7. Die Breite der Schultern. — Lass das Kind auf dem Sitze des Paidometers, mit seinem Rücken an dem aufrechten Stücke und die Schultern gut zurückgezogen, sitzen.

Bewege den langen Arm genau zu der Höhe der Schultern herab. Bewege die Schieber auf dieser Armstange aufwärts, bis sie an der Aussenseite der Schultern anliegen. (Acromion). Die Weite zwischen den beiden Schiebern ist die Breite der Schultern.

8. Das Gewicht. — Lass das Kind, in der gewöhnlichen Kleidung, auf der Plattform der Wage stehen. Wäge es, und wenn das Gewicht der Kleider des Kindes in Erfahrung zu bringen ist, so ziehe dasselbe von dem ganzen Gewicht ab.

II. Der Kopf. 9. Der horizontale Umfang. — Ausgehend von der Mitte der Stirn zwischen den Augenbrauen, führe das Messband um den Kopf in horizontaler Richtung, in der Höhe der Augenbrauen, herum.

10. Der vertikale Umfang. — Setze das Ende des Messbandes auf dem Gesicht genau vor der Mitte des Ohres an, und lege das Messband über den Scheitel des Kopfes bis zu demselben Punkte vor dem anderen Ohre.

11. Der sagittale Umfang. — Setze das Ende des Messbandes an die Nasenwurzel (wo die Nase sich mit der Stirn vereinigt) an, und lege das Messband über den Scheitel des Kopfes bis zu der Spitze des Halses (zu dem Grat des ersten Wirbels).

12. Die Länge des Kopfes. — Stelle die eine Spitze des Dickzirkels auf die Mitte der Stirn zwischen den Augenbrauen und die andere Spitze auf die Rückseite des Kopfes. Bewege die Spitzen zurück und vorwärts, bis die grösste Weite gefunden ist. Wenn der Dickzirkel mit einem Maasse versehen ist, lies von der Messungstafel ab. Wenn nicht, ziehe sorgfältig den Dickzirkel von dem Kopfe weg, und miss auf dem Lineal die Weite ab und schreibe sie nieder. Achte darauf, dass du den Dickzirkel senkrecht über den Kopf hältst.

13. Die Weite des Kopfes. — In derselben Weise, wie bei der letzten Messung, findet man die grösste Weite des Kopfes (ausschliesslich des Warzenfortsatzes).

Der cephalische Index. — Der cephalische Index ist die Weite des Kopfes, getheilt durch die Länge, oder:

$$\text{C. I.} = \frac{\text{Weite}}{\text{Länge}}.$$

Der Kopf eines Kindes mass in der Weite 125 mm. und in der Länge 160 mm., so:

$$\text{C. I.} = \frac{125 \times 100}{160} = 78{,}125.$$

III. Das Gesicht. 14. Die Höhe des Gesichts. — Stelle die eine Spitze des Dickzirkels auf die Spitze des Kinnes und die andere Spitze des Dickzirkels auf die Nasenwurzel, und nimm die Messung vor.

15. Die Weite des Gesichts. — Stelle die Spitzen des Dickzirkels auf die beiden Seiten des Gesichts etwa ein und ein halb Centimeter vor den Ohren, und nimm die Messung vor.

Der facialische Index. — Der facialische Index ist die Höhe des Gesichts, getheilt durch die Weite, oder:

$$\text{F. I.} = \frac{\text{Höhe}}{\text{Weite}}.$$

Das Gesicht eines Kindes mass in der Höhe 90 mm. und in der Weite 110 mm., so:

$$\text{F. I.} = \frac{90 \times 100}{110} = 81{,}81.$$

IV. Die Nase. 16. Die Höhe der Nase. — Stelle die eine Spitze des Dickzirkels an die Oberlippe gerade unterhalb der Nase und die andere Spitze an die Nasenwurzel, und nimm die Messung vor.

17. Die Breite der Nase. — Stelle die Spitzen des Dickzirkels auf die Seiten der Nase, und bewege sie auf und ab, bis die grösste Breite gefunden ist. Man achte darauf, dass man die Flügel (Alae) der Nase nicht zusammendrücke.

Der nasale Index. — Der nasale Index ist die Breite der Nase, getheilt durch die Höhe, oder:

$$\text{N. I.} = \frac{\text{Breite}}{\text{Höhe}}.$$

Die Nase eines Kindes mass in der Breite 35 mm. und in der Höhe 60 mm., so:

$$N.I. = \frac{35 \times 100}{60} = 58{,}33.$$

V. Die Brust. 18. Der Umfang bei der Einathmung. — Lass den Knaben den Rock und die Weste ausziehen. Lege das Messband um die Brust herum, in der Höhe der Warzen. Lass das Kind möglichst tief einathmen, halte zugleich das Messband lose um die Brust herum, so dass es in keiner Weise stört, und notire den grössten Umfang der erreicht wird. Nach einer Pause von einer Minute nimm sodann eine zweite Messung vor, und nach einer gleichen Pause eine dritte.

Ein Mädchen kann in gewöhnlicher Zimmerkleidung gemessen werden.

19. Der Umfang bei der Ausathmung. — In derselben Weise wie bei der letzten Messung miss den geringsten Umfang der Brust, bei möglichst gründlicher Ausathmung.

20. Der Umfang bei regulärer Athmung. — Lass das Kind von eins bis zehn zählen, oder sprich mit ihm, und nimm während dieser Zeit die Messung der Brust vor.

VI. Die Hand. 21. Die Breite an den Knöcheln. — Stelle die Hand des Kindes an den Knöcheln in den Schiebzirkel und ziehe den Schieber auf, sodass die Hand die beiden Seiten leicht berührt. Lies an der Messtafel die Breite ab.

22. Die Länge des Daumen. — Stelle die feststehende Spitze des Schiebzirkels auf das zweite Gelenk des Daumens des Kindes. Ziehe den Schieber auf, bis er die Spitze des Daumens leicht berührt. Lies ab, wie vorher.

23. Die Länge des Mittelfingers. — Stelle die feststehende Spitze des Schiebzirkels an den Knöchel des Mittelfingers und miss dann den Finger ebenso, wie vorher den Daumen.

Diese Messungen sollten an beiden Händen vorgenommen, und die Resultate müssen verglichen werden.

VII. Der Fuss. 24. Die Länge des Fusses. — Lass das Kind seine Schuhe ausziehen. Stelle seinen Fuss auf den Schiebzirkel, sodass die Ferse an dem feststehenden Stücke am Ende des Schiebzirkels gerade anliegt. Bewege den Schieber aufwärts, bis er lose auf der Spitze der grossen Zehe zu ruhen kommt. Lies dann an der Messtafel ab.

25. Die Breite des Fusses. — Stelle den Schiebzirkel kreuzweise auf die Fusssohle des Kindes. Bewege den Schieber auf-, den Schiebzirkel rück- und vorwärts, bis die grösste Breite gefunden ist. Lies ab, wie vorher.

Mache diese Messungen an beiden Füssen, und vergleiche die Ergebnisse miteinander.

Beobachtungen

I. Der Körper. 26. Die allgemeine Gestalt des Kindes. — Wenn das Kind vor dir steht, beobachte seine allgemeine Gestalt, ob es gross, klein, dick, hager, sehr kräftig etc., ist.

II. Der Kopf. 27. Die Grösse des Kopfes. — Beachte, ob der Kopf gross (macrocephalisch), klein (microcephalisch) oder von normaler Grösse ist.

28. Die Form des Kopfes. — Beachte, ob der Kopf hochgewölbt (oxycephalisch), lang (dolikocephalisch), kurz und breit (brachycephalisch), oder mit kielförmiger Stirn (scaphocephalisch) erscheint. Bemerke auch, ob der Kopf höckerig, rachitisch etc. ist, und ob irgend welche Narben auf dem Kopfe zu finden sind.

29. Die Fontanelle. — Beobachte die Fontanellen, wo immer sie gefunden werden.

30. Die Stirn. — Beachte, ob die Stirn breit, enge, überhängend, zurücktretend oder höckerig ist.

31. Der Gesichtswinkel. — Bemerke, ob der Gesichtswinkel schräg oder vertikal ist.

32. Die Stellungen des Kopfes. — Wenn das Kind vor dir steht, beobachte die Stellungen seines Kopfes, welche sein können: Beugung: vorwärts gebeugt auf die Brust; Emporrichten oder Zurückwerfen des Kopfes, wie beim Aufwärtsblicken; Drehung von einer Seite zur anderen in horizontaler Richtung, bei welcher der Kopf aufgerichtet bleibt, während das Gesicht sich nach der rechten oder linken Seite wendet; Neigung nach der einen oder anderen Seite, wobei das Ohr so gesenkt ist, dass die beiden Ohren nicht in der gleichen Höhe bleiben.

Das völlig gesunde Kind hält seinen Kopf aufrecht, wenn nicht irgend eine Ursache zu einer Abweichung vorliegt.

33. Die Bewegung des Kopfes. — Beobachte, ob das Kind dauernde Bewegungen des Kopfes zeigt, wie z. B. winkende oder zuckende.

III. Das Gesicht. 34. Die Form des Gesichts. — Beobachte, ob das Gesicht lang oder breit, flach oder rund ist; auch seinen allgemeinen Umriss. Bemerke, ob etwa die Backenknochen hervorstehen.

35. Der Zustand des Gesichts. — Bemerke, ob das Gesicht fett oder mager, blass oder geröthet ist, und ob die Haut glatt, oder ob sie reich an kleinen Falten ist.

Bemerke auch, ob und wo etwa Narben auf dem Gesichte zu sehen sind.

36. Die Gesichtszüge. — Bemerke, ob die Gesichtszüge feingeschnitten oder derb und grob sind.

37. Der Ausdruck des Gesichts. — Beachte, ob das Gesicht einen heiteren oder düsteren Ausdruck hat, ob es beweglich oder unbeweglich, choreisch, starr, hinstarrend, dumm, klug, ausdruckslos ist, und ob es einen steten Ausdruck seelischer Angst zeigt. Beobachte den Gesichtsausdruck während des Gespräches, und gieb genau acht auf irgend welche Gewohnheiten.

38. Die Seiten des Gesichts. — Halte vor das Gesicht des Kindes ein grosses Stück Karton, dessen vertikaler

Rand die Mittellinie des Gesichts trifft. Untersuche die beiden Seiten des Gesichts, und bemerke, ob die Bewegungen der beiden Seiten symmetrisch oder nicht symmetrisch sind. Die Asymmetrie der Bewegungen des Gesichts besteht darin, dass man mit dem einem Auge öfter oder dauernder, als mit dem anderen, blinzelt, oder den Mund bei weinerlichem oder lächelndem Ausdruck einseitig verzieht oder einen Eckzahn oder dergleichen mehr zeigt.

Man bemühe sich, die Karte so zu halten, dass die eine Seite des Gesichts des Kindes nicht mehr als die andere, oder überhaupt nicht beschattet wird.

39. Die Zonen des Gesichts. — Halte ein Stück Karton horizontal über die Augenbrauen, indem du den einen Rand auf die Stirn legst; dann befindet sich oberhalb des Kartons die obere Zone. Dann halte den Karton quer über das Gesicht, gerade unterhalb der Augenhöhlen; unterhalb des Kartons ist dann die untere Zone; hältst du darnach ein Stück Karton so, dass du die obere Zone, und ein anderes so, dass du die untere abgrenzest: dann hast du zwischen den beiden Blättern die mittlere Zone.

Es wird gut sein, die anderen Zonen zu bedecken, während man die eine Zone untersucht.

(1). Die obere Zone. — Bemerke die Furchen in der Stirn. Zwei Arten von Furchen können beobachtet werden: horizontale, wie sie beim Hinaufziehen der Augenbrauen, und verticale, wie sie beim Zusammenziehen der Augenbrauen entstehen. Bemerke genau, ob diese Furchen beständig zu sehen oder durch besonders starkes Licht oder eine andere Ursache für den Augenblick sichtbar geworden sind. Wenn dies Letztere der Fall ist, so versuche das Kind so zu stellen, dass du den gewöhnlichen Anblick seiner Stirn erhältst.

(2). Die mittlere Zone. — Beachte, ob die Augen ganz offen oder halbgeschlossen sind, ob das untere Augenlid voll ist; ob ein häufiges Blinzeln stattfindet; oder ob alles in einem normalen Zustande ist.

(3). Die untere Zone. — Sieh zu, ob ein beständiges Lächeln auf dem Gesicht liegt, und besonders, ob es ein einseitiges Lächeln ist; ob es ein Grinsen ist; ob die Lippen hervorstehen; ob der Mund geöffnet und der Kiefer niedergedrückt ist.

IV. Die Nase. 40. Bemerke, ob die Nase weit oder enge, ob an der Wurzel tief eingeschnitten; gieb ihre Form an.

V. Der Mund. 41. Beachte die Grösse und die Gestalt des Mundes, sowie die Lage der Mundwinkel.

VI. Die Kiefer. 42. Bemerke, ob die Kiefern gross, schwer, klein, schmal etc. sind, auch ob prognatisch.

VII. Die Lippen. 43. Bemerke, ob die Lippen dick, dünn, gut geschnitten, aufgesprungen, schartig sind, oder ob eine Narbe von einer früheren Hasenscharte vorhanden ist.

VIII. Die Zunge. 44. Lass das Kind seine Zunge herausstrecken. Sie zu, ob Narben darauf sind; ob sie sehr zittert, wenn sie 30 Secunden lang herausgestreckt wird; beachte auch den allgemeinen Charakter der Zunge und besonders ihrer Spitze.

IX. Die Zähne. 45. Der Zustand. — Bemerke, ob die Zähne mangelhaft, hohl, an der Spitze zerbissen, und ob irgend welche plombirt sind.

46. Die Stellung. — Bemerke, ob die Zähne regelmässig oder unregelmässig angeordnet sind, und ob irgend welche auffallend hervorstehen.

47. Die Anzahl. — Zähle die Zähne, und bemerke, ob welche ausgezogen sind. Auch notire die Zahl der Milchzähne und der bleibenden Zähne.

X. Der Gaumen. 48. Bemerke, ob der Gaumen gewölbt, enge, gespalten oder sattelartig ist.

XI. Die Ohren. 49. Bemerke, ob die Ohren symmetrisch oder unsymmetrisch sind; ob die Schnecke verengt, ob das Ohrläppchen angewachsen ist; ob das Ohr von dem Kopfe absteht.

XII. Die Augen. 50. Die Farbe. — Bemerke die Farbe der Augen des Kindes, — ob blau, grau, braun oder schwarz.

51. Die Lage. — Bemerke, ob die Augäpfel aus den Augenhöhlen hervorstehen, oder ob sie tief liegen.

52. Die Bewegungen. — Lass das Kind ein Ding, welches du in deiner Hand hältst, ansehen. Bemerke, ob es dieses fest ins Auge fasst, oder ob seine Blicke herumschweifen; und wenn letzteres der Fall, ob die Augenbewegungen horizontal, vertical, oder beides sind. Beachte, ob etwas Nystagmus vorliegt.

53. Die Defekte. — Bemerke, ob das Kind schielt oder zum Schielen neigt; ob Coloboma vorliegt; ob es eine Brille trägt, und was für eine Nummer; ob es sehr schlecht sieht; und ob noch andere Mängel vorhanden sind.

XIII. Die Augenlider. 54. Bemerke, ob die epicantischen Falten auffallend hervortreten; ob ein dunkler Ring unter dem Auge zu sehen ist; ob die Lidspalte klein ist.

XIV. Das Rückgrat. 55. Die Seitwärtskrümmung (Scoliosis). — Lass das Kind, die Fersen aneinander, den Kopf aufrecht, die Hände an den Seiten, gerade stehen. Sieh das Kind von vorne und hinten an, und bemerke, ob die eine Schulter niedriger ist, als die andere; auch ob es mit den Achseln zuckt.

56. Die Vorwärtskrümmung (Lordosis). — Lass das Kind seine Hände nach vorn ausstrecken. Stelle dich so, dass du das Kind im Profil vor dir hast, und siehe zu, ob das Rückgrat in den Lenden übermässig nach vorne und im Oberkörper übermässig nach hinten gewölbt ist. Bemerke, ob das Kind eine Hühnerbrust hat.

XV. Die Arme. 57. Lass das Kind seine Arme nach beiden Seiten ausstrecken, mit den Handflächen nach unten. Bemerke, ob die Arme die gleiche Höhe mit den Schultern haben; ferner, ob Bewegungen an den Schultern stattfinden.

XVI. Die Hände. 58. Lass das Kind seine Arme, wie bei 57, ausstrecken. Bemerke die Lage seiner Hände.

Die Hand kann ausgestreckt werden, indem der Daumen an die Handfläche angedrückt ist oder nach unten absteht, oder sie kann sogar schlaff herabhängen.

59. Lass das Kind seine Hände über seinen Kopf, über die Gesichtshöhe, mit der flachen Hand nach vorne erheben. Bemerke, ob es sie auf der gleichen Höhe hält; ob der Daumen oder die Finger der einen Hand oder beider Hände sich ausspreizen; ob beide Hände zugleich etwa 30 Sekunden lang in derselben Höhe verharren.

XVII. Die Finger. 60. Lass das Kind seine Arme an die Seiten halten, die flache Hand nach vorne, und die Finger ausgestreckt. Bemerke, ob die Finger Zuckungen zeigen, und zwar, ob nach der Seite oder nach rückwärts und vorwärts, oder beides; und wenn dies der Fall ist, welche Finger am meisten dazu neigen, und ob die Zuckungen stark oder schwach sind.

XVIII. Die Haut. 61. Die Farbe. — Bemerke die Farbe der Haut des Kindes, — braun, roth, gelb oder weiss. Beobachte die Farbe (1.) der bedeckten Körpertheile, (2.) der unbedeckten Körpertheile, und (3.) der Innenseite der Hände.

62. Der Zustand. — Bemerke, ob die Haut sehr dünn oder grob, und ob sie von gesunder Farbe ist. Eine gute Haut ist dünn, hell und durchscheinend, nicht zu blass, und zeigt ein lebhaftes Farbenspiel, besonders wenn die Gesichtsfarbe hell ist.

XIX. Das Haar. 63. Die Farbe. — Bemerke die Farbe des Haares des Kindes, — ob blond, braun, roth oder schwarz.

64. Das Aussehen. — Bemerke, ob das Haar des Kindes straff, wellig oder lockig ist. Bemerke seine Textur.

65. Die Anordnung. — Bemerke die allgemeine Anordnung der Haare auf dem Kopfe, besonders, ob sie in einer scharfen Linie an der Stirn aufhören, oder ob sie die Stirn zum Theile bedecken, wie ein weicher, weit ausgedehnter Flaum.

66. Die Form. — Man betrachte ein Haar mikroskopisch.

Die Versuche

I. Die Stärke des Körpers. 67. Die Zugkraft.

(1). Die Hände und die Arme. — Lass das Kind mit seinen Händen das Dynamometer an den entgegengesetzten Seiten ergreifen und es, etwa in Schulterhöhe, gerade vor sich halten. Dann lass es mit voller Kraft ziehen, dreimal, mit Ruhepausen dazwischen. Notiere die Zahlen und den Durchschnitt. Dieser Versuch kann auch mit der Federwage angestellt werden.

Auch bei anderen Kraftproben sollten jedesmal drei Versuche angestellt werden.

(2). Der Arm. — Befestige die Federwage in einer für das Kind bequemen Höhe, und zwar so, dass es den Handgriff erfassen und mit einem Arm nach der Schulter hin ziehen kann. Achte darauf, dass beim Ziehen nicht das Körpergewicht mitwirke. Mache den Versuch mit jedem Arm.

(3). Der Unterarm. — Lass das Kind den Handgriff der Federwage ergreifen und mit dem Unterarm ziehen. Sieh zu, dass keine Beugung an der Schulter oder dem Handgelenke stattfindet. Dieses kann verhindert werden, wenn man etwas hinter die Schulter und den Ellbogen stellt und das Handgelenk zwischen kleine Holzleisten oder dergleichen festbindet. Mache den Versuch mit jedem Vorderarm.

(4). Die Hand. — Lass das Kind den Handgriff der Federwage mit einer Hand ergreifen und das Handgelenk beugen. Notire die Zahl, die sie angeben wird. Sieh zu, dass keine Beugung am Ellbogen oder an der Schulter stattfindet. Prüfe beide Hände.

(5). Die Finger. — Lass das Kind den Handgriff der Federwage mit allen Fingern der einen Hand ergreifen und sie an den Knöcheln krümmen. Prüfe jede Hand, jeden Finger und Daumen einzeln.

Ein Dynamometer kann auch in den Proben (2)—(5) angewandt werden.

68. Das Heben. — Stecke einen Stock oder eine Ruthe durch den Ring der Federwage. Lass das Kind auf dem Stocke stehen, so dass die Federwage zwischen seinen Füssen steht. Lass das Kind den Handgriff mit beiden Händen erfassen und mit aller Anspannung seiner Kräfte emporziehen.

Das Rücken- und Armdynamometer ist auch für diesen Versuch anwendbar.

69. Der Druck. (1). Das Maximum. — Lass das Kind das Dynamometer mit einer Hand ergreifen und es mit seiner ganzen Kraft drücken. Prüfe beide Hände.

(2). Die Ausdauer. — Lass das Kind zu dem Maximum des vorigen Versuchs kommen und mit diesem Druck das Dynamometer wenn möglich 10 Secunden lang halten. Mache Notizen über die Bewegungen des Zeigers auf dem Zifferblatte während dieser Zeit. Prüfe beide Hände.

70. Der Schlag. — Stelle Galton's Apparat auf, so dass sich das Drahtseil in der Höhe der Schulter des Kindes befindet. Lass das Kind den Handgriff erfassen und von der Schulter aus einen Schlag ausführen. Prüfe beide Arme. Suche die Schlagkraft des Vorderarms, der Hand und der Finger zu ermitteln, ungefähr so, wie es bei dem Ziehversuche geschehen ist. Benutze dazu den Apparat von Galton.

71. Der Stoss. (1). Das ganze Bein. — Richte alles so ein, dass das Kind mit seinen Füssen in der Höhe des Drahtseiles im Galtonschen Apparat (für den Schlag) steht. Befestige den Handgriff an dem Fusse des Kindes, und lass es mit ganzer Kraft stossen. Prüfe jedes Bein einzeln.

(2). Der Unterschenkel. — Lass das Kind so sitzen, dass sein Bein vom Knie an frei schwingen kann. Befestige den Handgriff an seinem Fusse, und lass es mit dem vom Knie abwärts schwingenden Bein mit aller Kraft stossen. Prüfe jedes Bein einzeln.

(3). Der Fuss. — Lass das Kind sitzen, wie bei dem vorigen Versuche. Ziehe sein unteres Bein nach rückwärts, und binde es an, sodass es nicht bewegt werden kann. Lass es seine Zehen soweit als möglich zurückziehen. Stelle den Handgriff des Apparates über seine Zehen, und lass es den Fuss mit möglichst grosser Gewalt vorwärts stossen. Prüfe jeden Fuss einzeln.

Benutzt man Galton's Apparat, so muss darauf geachtet werden, dass die ganze Wucht des Schlages und des Stosses auf den registrirenden Apparat einwirkt.

II. Die vitale Capacität. 72. Lass das Kind mehrere Male nacheinander möglichst tief Athem holen und dann seinen Mund an das Rohr des Spirometers bringen, sodass die Luft aus den Lungen in das Spirometer möglichst vollständig ausströmt. Lies die Ziffer für die vitale Capacität an der Skala ab.

III. Das Gehör. 73. Die Schärfe des Gehörs. (1). Die Taschenuhr. — Verstopfe das eine Ohr des Kindes mit Watte und verbinde seine Augen. Dann lass es das eine Ende eines Messbands neben sein Gesicht, direkt vor das andere Ohr, halten. Halte mit einer Hand das Messband, bewege mit der anderen Hand eine Uhr längs des Messbandes hin und her, und lass das Kind sagen, wann es sie ticken hört, bis die Grenze seines Hörens gefunden ist. Die Uhr muss zuweilen sehr entfernt gehalten oder auch bedeckt werden, damit man erfährt, ob das Kind sie wirklich hört oder nicht. Der Experimentator kann „jetzt!" sagen, und das Kind kann einen Finger aufheben, wenn es die Uhr hört. Achte sorgfältig darauf, dass die Uhr weder das Messband noch die Hand, welche das Messband hält, berühre. Eine arretierbare Uhr ist für diesen Versuch sehr geeignet, da sie jederzeit angehalten werden kann, wenn man erfahren will, ob das Kind sie wirklich hört. Mache denselben Versuch mit dem anderen Ohr.

Wenn wünschenswert, kann das Messband für diesen Versuch so eingerichtet werden, wie im folgenden.

(2). Politzer's Akumeter. — Befestige das Messband an einer Seite eines Zimmers an der Wandtafel da, wo das Kind stehen soll, und zwar in der Höhe des Kopfes; ebenso das andere Ende des Messbandes in derselben Höhe an der anderen Seite des Zimmers. Stelle das Kind mit der hinteren Seite des Kopfes an das Messband, und lass es die Augen und ein Ohr schliessen, wie bei dem letzten Versuche. Stelle dich nahe an das Messband, jedoch ohne es zu berühren, lass das Akumeter langsam 1—5 deutliche Schläge geben und das Kind sagen oder auf die Tafel schreiben, wieviel Schläge es hört. Gehe an dem Messbande hin und her, bis die grösste Entfernung gefunden ist, in welcher das Kind die Zahl der Schläge noch richtig zu hören vermag. Stelle denselben Versuch mit dem anderen Ohr an.

(3). Das Flüstern. — Stellung des Kindes, wie bei dem letzten Versuche. Flüstere ihm eine Zahl zwischen 1 und 99 zu, und lass das Kind auf die Schultafel schreiben, was es hört. Suche, wie vorhin, den entferntesten Punkt, an welchem es das Geflüster noch richtig hört. Achte darauf, dass das Geflüster zu jeder Zeit gleich leise sei. Bevor man flüstert, sollte man jedesmal ausathmen. Verabrede vorher mit dem Kinde ein Zeichen, welches es jedesmal geben soll, wenn es mit schreiben fertig ist, also wieder auf das Flüstern achten kann.

(4). Das Sprechen. — In derselben Weise, wie bei dem letzten Versuche, stelle die Entfernung fest, bis zu welcher das Kind das Sprechen hören kann. Sprich alsbald nach dem Ausathmen und womöglich jedesmal mit derselben Tonhöhe, Tonstärke, Dauer, Betonung etc. Vermeide Explosivlaute.

Dieser Versuch ist mehr für solche Kinder bestimmt, welche bei den anderen Versuchen Defekte gezeigt haben.

Bei den letzten zwei Versuchen (Flüstern und Sprechen) können andere Wörter gebraucht werden, als Zahlwörter. Die Thatsache muss beachtet werden, dass einige Laute

weiter und besser hörbar sind, als andere, und so auch einige Lautverbindungen.

(5). Die Stimmgabel. a. Lass das Kind ein Ohr schliessen. Schlage eine Stimmgabel an, halte dieselbe an den Kopf des Kindes — an den Scheitel, hinter das Ohr, auch an die Zähne — und stelle die Länge der Zeit fest, während welcher es den Ton hört. Lass es dann beide Ohren schliessen. Schlage die Stimmgabel, wie vorher, an, und stelle wieder die Zeit fest. Thue dasselbe, wenn nur das andere Ohr offen ist, und auch wenn beide Ohren offen sind. (Weber's Versuch).

Das normale Ohr hört die Stimmgabel lauter und länger, wenn das Ohr geschlossen, als wenn es offen ist.

b. Lasse das Kind ein Ohr schliessen. Schlage eine Stimmgabel an, halte sie auf den Scheitel des Kindes oder gegen die oberen Schneidezähne, und konstatiere die Länge der Zeit, während welcher es den Ton hört. Schlage die Stimmgabel, wie vorher, an, halte sie vor das offene Ohr des Kindes und konstatire, wie lange das Kind jetzt den Ton hört. Versuche dasselbe mit dem anderen Ohre. (Rinne's Versuch).

Ein normales Ohr wird die Stimmgabel bei der Luftleitung länger als bei der Knochenleitung hören.

Man kann den Versuch auch auf andere Weise machen, indem man die Stimmgabel auf den Kopf hält, bis sie nicht mehr gehört wird, und dann sie an das offene Ohr bringt.

c. (a). Lass das Kind ein Ohr schliessen. Nimm eine tiefe Stimmgabel (A = 110 v. s.), und suche zu erfahren, ob das Kind sie lauter hört, wenn sie auf seinen Kopf (Knochenleitung) oder nahe vor sein Ohr (Luftleitung) gehalten wird. Prüfe auch das andere Ohr. (b). Experimentiere mit einer kleineren Stimmgabel (c^1 = 264 v. s.). (Emerson's Versuch).

Ein normales Ohr wird die tiefere Stimmgabel lauter bei Knochenleitung als bei Luftleitung hören und die höhere Stimmgabel lauter bei Luftleitung als bei Knochenleitung.

d. Schlage eine Stimmgabel an, bewege dieselbe, während sie schwingt, vor dem Ohre des Kindes auf und ab, und frage es, ob der Ton stärker zu sein scheint, so oft die Stimmgabel sich in gleicher Höhe mit dem Gehörgang befindet. Lass das Kind sein Ohr schliessen, und mache den Versuch mit der Stimmgabel, wie vorher.

Einem gesunden Ohre wird der Ton der Stimmgabel stärker erscheinen, wenn das Ohr offen ist, unverändert jedoch, wenn das Ohr geschlossen. Einem abnormen Ohre wird der Ton in beiden Fällen unverändert erscheinen.

74. Die Lokalisation der Töne in der Wahrnehmung. (1). Schlage eine grosse und lautschallende Stimmgabel an, und stelle sie auf den Scheitel des Kindes. Lass es sagen, woher der Ton kommt. Lass es ein Ohr schliessen und dann sagen, woher der Ton kommt. Im ersten Falle wird es scheinen, als befindet sich die Gabel im Inneren des Kopfes, besonders im Hinterkopf, im zweiten Falle in dem geschlossenen Ohre. Stelle die Stimmgabel auf andere Theile des Kopfes, während die Ohren offen sind, und wenn jene in der Gegend des Hinterkopfes steht, beachte, ob das Kind sagt, dass der Schall in dem entgegengesetzten Ohre erklinge.

(2). Lass das Kind einen tiefen Ton singen und dann sagen, woher er zu kommen scheint. Lass es noch einmal singen und während des Singens zuerst ein Ohr und dann beide Ohren schliessen, und beachte, ob ihm der Ton zuerst in der Kehle, sodann in dem geschlossenen Ohre und zuletzt in der Mitte des Kopfes klingt.

75. Der höchste Ton. — Mit Galton's Pfeife findet man den höchsten Ton, den das Kind hören kann, oder mit Koenig's Klangstäben, am besten mit Preyers Stimmgabeln, die Appun in Hanau verfertigt.

76. Die Beurtheilung der Richtung des Schalls. (1). Lass das Kind mit geschlossenen Augen auf einem Stuhle sitzen und den Telegraphsnapper (cri-cri) in einer Entfernung von etwa einem halben Meter von seinem Kopfe

schnappen. Lass das Kind sagen, wo es ihn hört, — oben, unten, vorn, hinten, rechts oder links. Notiere die Antworten genau.

(2). Stelle hinter den Kopf des Kindes ein Stater, an dem ein Meterstab befestigt ist, in gleicher Höhe mit den Ohren, horizontal (senkrecht zu der Medianfläche) und ein halbes Meter vom Kopfe entfernt. Der Mittelpunkt des Stabes muss der Mitte des Kopfes gegenüber stehen. Lass nun den Telegraphsnapper (cri-cri) in der Mitte und dann auf der rechten und auf der linken Seite des Stockes schnappen, um festzustellen, wie weit von der Medianfläche das Kind einen Unterschied wahrnehmen kann. Probiere es auch vorne und jedem Ohre gegenüber. Empfehlenswert ist es, einmal in der Mitte schnappen zu lassen und „jetzt" zu sagen und dann sofort an derselben Stelle oder rechts oder links das Geräusch zu wiederholen und das Kind „hier" oder „rechts" oder „links" sagen zu lassen, je nachdem es die Richtung des Geräusches erkennt. Notiere jedesmal die Angaben.

77. Der Umfang der Stimme. — Spiele langsam die Tonleiter auf der Orgel oder auf dem Piano, und singe sie zugleich; überrede auch das Kind, dass es die Tonleiter mitsinge. Beachte den Umfang seiner Stimme. Lass das Kind nach dir singen. Beachte, welche Töne Brusttöne und welche Kopftöne sind, und wo die Übergangstöne liegen, auch welcher Ton am stärksten und welcher am schwächsten hervorgebracht wird. Das Kind darf nicht bis zu den Fisteltönen gehen. Am besten beobachtet man das Kind, wenn es für sich allein singt. Man darf es nicht verwirren.

78. Die Unterscheidung der Consonanzen und Dissonanzen. (Intervallensinn). (1). Schlage zwei Töne zugleich an, auf dem Piano oder auf der Orgel — Oktave, Quinte, Quarte, grosse Terz, kleine Terz, grosse Sexte, kleine Sexte, und grosse Sekunde — in der mittleren Lage. Schlage jeden von diesen viermal an. Stelle das Kind so, dass es das Instrument im Rücken hat, uud lass es sagen,

wie viele Töne jedesmal angeschlagen worden sind, und ob sie ihm schön (als Consonanzen) oder schlecht (als Dissonanzen) klangen. Notiere sorgfältig sowohl die Zahl der von dir angeschlagenen Töne, als auch die Angaben des Kindes.

(2). Gieb, wie vorher, drei Töne — den C-Dur-Akkord, den C-Moll-Akkord und eine Dissonanz — an. Notiere ebenso, wie vorher.

Bei den vorigen Versuchen triff die Auswahl in unregelmässiger Folge. Dann stellt sich heraus, ob das Kind musikalisches Gehör hat oder nicht.

79. Die Unterscheidung der Tonhöhe. (1). Die Orgel oder das Piano. — Schlage in der mittleren Lage einen Ton an und dann einen anderen, und lass das Kind sagen, welcher Ton der höhere ist. Versuche es mit der kleinen Sekunde in verschiedenen Tonleitern und beachte, ob das Kind die Töne besser innerhalb der einen als innerhalb der anderen unterscheidet.

(2). Die verstimmten Stimmgabeln. — Lass das Kind eine Reihe der verstimmten Stimmgabeln nach ihrer Tonhöhe ordnen. Es kann eine Stimmgabel anschlagen und an sein Ohr über einen Resonator halten. Lass es nicht zwei zugleich tönende Stimmgabeln vergleichen, vielmehr soll jede Stimmgabel einzeln angeschlagen werden. Beachte die Art und Weise der Anordnung der Stimmgabeln.

IV. Das Gesicht. 80. Die Schärfe. (1). Das Fernsehen. a. Cohn's Tafel. — Hänge die Tafel an die Wand in der Höhe der Augen des Kindes bei gutem Tageslicht. Lass das Kind 6 Meter vor der Wand stehen und durch eine Handbewegung jedesmal schnell anzeigen, wie die Haken geöffnet sind, nach oben, unten, rechts oder links. Wenn das Kind dieses in einer Entfernung von 6 Metern nicht thun kann, lass es sich der Wand, soweit es nötig, nähern. Ein Kind mit normalem Sehsinn sollte das Verlangte in einer Entfernung von 6 Metern in 36 Sekunden ausführen. Wenn ein Kind mit ungewöhnlich scharfem

Auge gefunden wird, lass es zurückgehen. Prüfe jedes Auge einzeln.

b. Snellen's Sehprobe. Zeige dem Kinde die Tafel und erkläre ihm, dass es auf jedesmalige Frage sagen soll, nach welcher Richtung die E's geöffnet sind, ob nach oben, unten, rechts oder links. Stelle die Tafel an die Wand, und beachte, wie weit das Kind von der Tafel entfernt ist, und welche E's es richtig angiebt. Prüfe jedes Auge einzeln.

(2) Das Sehen in der Nähe. a. Die Diamantschrift. Gieb Druckproben von passender Grösse, in Diamantschrift, auf steifem Papier, dem Kinde in die Hand, und lass es dieselben aus möglichst grosser Entfernung lesen. Das normale Auge muss diesen Druck aus einer Entfernung von 30 Centimetern lesen können. Prüfe jedes Auge einzeln.

b. Galton's Apparat. — Lass das Kind sich so setzen, dass es leicht in die Öffnung hineinblicken kann. Lass es die fernste Karte lesen, die es überhäupt zu erkennen vermag. Merke, welche es ist. Prüfe jedes Auge einzeln.

Wenn das Kind richtig und schnell aus den Entfernungen, welche für normales Sehen angegeben sind, lesen kann, so hat es die normale Sehschärfe. Kann es nur aus geringeren Entfernungen schnell und richtig lesen, so liegt Kurzsichtigkeit (Myopie) vor. Wenn das Kind aus keiner Entfernung richtig und schnell lesen kann, oder etwa die kleinen Lettern sehr nahe ans Auge gehalten werden müssen, und die grossen Lettern bald in einander verschwimmen, und wenn beim Lesen bald Ermüdung der Augen eintritt, so liegt Übersichtigkeit oder Weitsichtigkeit (Hypermetropie) oder Schwachsichtigkeit vor. Mit schlechtem Sehen ist oft Schielen (Strobismus) verbunden. (Presbyopie, die Weitsichtigkeit des höheren Alters, tritt gewöhnlich erst nach dem 40. Lebensjahre ein).

81. Der Astigmatismus. Der Astigmatismus rührt von Unregelmässigkeiten in der Wölbung der Hornhaut und der Krystalllinse her. Es giebt zwei Hauptarten des Astigmatismus: den regelmässigen und den unregelmässigen. Bei dem regelmässigen stehen die Meridiane der grössten

und der geringsten Strahlenbrechung seitens der gekrümmten Flächen in rechten Winkeln zu einander, während bei dem unregelmässigen Astigmatismus diese andere Winkel bilden. Der Astigmatismus ist oft mit Myopie und Hypermetropie verbunden und dann häufig eine Ursache der Überanstrengung der Augen und der Kopfschmerzen; denn was dem Auge infolge der Abnormitäten fehlt, sucht es durch unausgesetzte Accomodationsanstrengungen zu ersetzen.

Die Untersuchung auf Astigmatismus. — Befestige Pray's Tafel an der Wand, in der Höhe der Augen des Kindes. Lass es 6 Meter entfernt davon stehen und sagen, welcher Buchstabe ihm am dunkelsten erscheint. Prüfe jedes Auge einzeln. Vielleicht findet das Kind eine ganze Reihe von Buchstaben am dunkelsten, ohne einen bestimmten Buchstaben zu bezeichnen; dann bedecke alle Reihen, ausser dieser einen, und lass das Kind die dunkelsten Buchstaben herausfinden. Dränge indess nicht zu sehr. Wenn das Kind die Buchstaben in einer Entfernung von 6 Metern nicht sehen kann, so lass es näher treten. Nach der Zahl über dem Buchstaben, welchen das Kind am dunkelsten findet, richtet sich die Wahl der Brillen. Es giebt jedoch viele Kinderaugen, welche alle Buchstaben gleichmässig dunkel sehen. Man findet es leicht durch Drehen der Pray'schen Tafel heraus.

82. Die Farbenblindheit. Farbenblindheit, welche sich in Farbenverwechselungen äussert, kann angeboren oder erworben sein. Die letztere ist häufig die Folge von übermässigem Tabaksgenusse. Die durch Krankheit oder Verletzung erworbene Farbenblindheit ist oft von mangelhaftem Formsehen begleitet, was durch Snellen's Versuch, wie er unter Nummer 80, (1), b. angegeben ist, festgestellt werden kann. Gewöhnlich werden Roth und Grün verwechselt, Blau und Gelb selten.

Holmgren's Methode der Untersuchung auf Farbenblindheit. — Sie besteht darin, dass man das Kind von verschiedenen Wollsträhnen die gleichfarbigen

zusammen legen lässt. Man muss sehr sorgfältig zu Werke gehen und dem Kinde genau erklären, was man von ihm will; sonst könnte es Farbenblindheit zu zeigen scheinen, während es in Wirklichkeit nicht verstanden hat, was man von ihm fordert.

Versuch I. — Lege die bunten Wollsträhne auf ein weisses Tuch, welches auf einem gut beleuchteten Tische ausgebreitet ist, der zu dem Kinde in der Höhe passt. Nimm die grüne Wollprobe, oder wähle eine von der hellsten Schattirung des reinen Grün aus, weder von einem gelblichen, noch von einem bläulichen. Lege diese separat und lass das Kind diejenigen anderen Farben dazulegen, welche ihm von derselben Farbe, wie die abseits liegende, zu sein scheinen. Es wird nothwendig sein, dem Kinde zu erklären, dass nicht ganz gleiche Strähne gewünscht werden, und dass es auch die heraussuchen darf, welche ihm von dunklerer oder hellerer Schattirung zu sein scheinen, so lange nur der Farbenton derselbe ist. Es ist oft nöthig, dem Kinde den Versuch vorzumachen und dann die verschiedenen sortirten Proben wieder unter einander zu mengen. Lass auf keinen Fall das Kind irgend einen Farbennamen hören. Wenn das Kind diese Auslese richtig durchführt, so hat es den normalen Farbensinn; wenn es aber z. B. grau, hellbraun, blassroth und intensivroth und grün auf einen Haufen legt, so ist es farbenblind.

Wenn das Kind als farbenblind erkannt ist, so muss geprüft werden, welcher Art die Farbenblindheit ist.

Versuch II. — Lege die hellpurpurne Wollprobe beiseite. (Der Ausdruck purpur wird gebraucht, um eine Farbe zu bezeichnen, welche mehr einem Rosa gleicht, als der Purpur, den man gewöhnlich im Handel antrifft.) Lass das farbenblinde Kind die ihm gleichartig erscheinenden Wollsträhne neben das Muster legen, wie beim vorhergehenden Versuche.

Wenn das Kind nur Rosa und Purpur zusammenlegt, dann ist es nicht typisch farbenblind. Wenn es Blau und

Grün und Braun und Gelb zu dem Rosa hinzuthut, dann ist es total farbenblind. Wenn es nur Grün und Grau mit zu dem Purpur legt, dann ist es roth-grün-blind. Wenn es Roth und Grün immer trennt, dagegen Blau und Gelb zusammenlegt, dann ist es blau-gelb-blind, was selten vorkommt.

83. Die Messung des Farbensinnes. Ehe dieser Versuch gemacht wird, sollte ermittelt werden, ob das Kind das normale monoculare und binoculare Sehen für Formen (Vergl. No. 80) und Farben besitzt (Vergl. No. 82).

Stelle Oliver's Farbensinnmesser in gute Beleuchtung. Lass das Kind 5 Meter (16 Fuss) davon entfernt stehen, mit dem Rücken nach dem Licht; und wenn nur ein Auge zu prüfen ist, soll das andere geschlossen werden. Drehe die Tafel so, dass die gewünschte Farbe unter dem beweglichen Schieber ist. Öffne den Schieber so weit, dass 1 qmm der gefärbten Fläche sichtbar wird, und lass das Kind sagen, welche Farbe es sieht. Bewege dann den Schieber so, dass eine etwas grössere farbige Fläche dem Auge des Kindes ausgesetzt wird, und lass es wieder die Farbe nennen. Vergrössere dann die sichtbare Fläche immer mehr, bis das Kind fähig ist, die ihm gezeigte Farbe genau zu bezeichnen. Notire sorgfältig die Grösse der den Augen des Kindes ausgesetzten Fläche und die Angaben des Kindes.

Vielleicht wird es nützlich sein, dem Kinde die verschiedenen Farben vor der Prüfung zu zeigen, sodass es die Farben, welche es sieht, richtig benennen kann. Wenn es mit der ersten Karte geprüft wird — die roth, grün, veilchenblau und blau enthält — muss das Kind roth, grünlichblau, hellgrün, grün, grau, gelb, rosa, veilchenblau und blau richtig bezeichnen können. Für Kinder, die hierfür noch zu klein sind, sollte eine Farbentafel gebraucht werden, auf der sie diejenigen Farben bezeichnen, welche, nach ihrer Meinung, jener Farbe, die sie auf dem Farbensinnmesser sehen, am ähnlichsten sind.

Schluss

Wieviel diese Abhandlung dazu beizutragen vermag, das Studium des Kindes zu einer besonderen Wissenschaft zu erheben, das zu entscheiden, muss der Zukunft überlassen bleiben. Je mehr ich mich mit der Paidologie beschäftige, desto mehr sehe ich ein, was alles zu thun ist. Jeder Schritt, den ich gehe, zeigt mir, dass es möglich ist, einen weiteren zu thun, und dass zur richtigen Ausführung eines jeden Schrittes es nur besonderer Vorbereitung und grosser Sorgfalt bedarf. An jedem Tage, an welchem ich tiefer in die Paidologie eindringe, wird es mir von neuem klar, dass die Idee dieser Wissenschaft nicht auf Phantasie, sondern auf Realitäten gegründet ist, und dass ich selbst wohl noch die Zeit erleben kann, wo sie den anderen Wissenschaften gleichstehen und in hohem Maasse dazu beitragen wird, unsere Jugenderziehung zu verbessern und zu veredeln. Es ist mir so klar, wie es nur irgend jemandem sein kann, dass die Paidologie sehr grosse Schwierigkeiten zu überwinden haben wird, wenn sie den Anspruch auf den Rang einer selbständigen Wissenschaft macht. Hat es doch jede der bestehenden Wissenschaften viel Mühe gekostet, sich den Platz zu erobern, welchen sie jetzt einnimmt, und die Paidologie als eine neue Wissenschaft hat sogar noch mit besonderen Schwierigkeiten zu kämpfen, weil der Gegenstand, mit welchem sie sich beschäftigt, so viele Angriffspunkte für das Studium bietet.

Er ist aber von so grosser Wichtigkeit, dass er sogar Material für andere Wissenschaften liefert. Ja, es möchte fast scheinen, als ob das Studium des Kindes vollständig zu diesen Wissenschaften gehörte und auf keine Weise mehr von ihnen getrennt werden könnte. Auch mögen Manche nicht dazu neigen, eine neue, besondere Wissenschaft für einen Gegenstand zu gründen, der in der That so umfangreich und so tiefgehend ist, dass, wie es scheint, mehrere Wissenschaften sich damit beschäftigen müssten, und nicht eine allein ihn jemals ganz zu umfassen vermag. Diese Bedenken dürften sich bald zerstreuen lassen; denn man wird einsehen, dass dieser Gegenstand gerade wegen seiner Grösse und Wichtigkeit am allermeisten verdient, einer besonderen Wissenschaft zu Grunde zu liegen, deren einziger Zweck es ist, das Wesen des Kindes zu erforschen. Diese Wissenschaft will nicht das Forschungsgebiet der anderen Wissenschaften einschränken, sondern einen Mittel- und Sammelpunkt für alle auf das Kind bezüglischen Studien schaffen. Ich kann nichts so sehr wünschen, als dass die Wissenschaft des Kindes sich die Stellung erringen möge, welche sie einnehmen könnte und sollte, und dass so verwirklicht werde die Idee der **Paidologie.**

Anhang: Bibliographie

Es wird hier nicht beabsichtigt, alles das anzuführen, was zur Erforschung des Kindes geschehen ist, wohl aber soviel, dass man sich einen Begriff von der Ausdehnung dieses Forschungsgebietes machen und sich darüber klar werden kann, welche Punkte bisher übersehen wurden. Zugleich sollen dem, der dieses Gebiet studirt, nach verschiedenen Richtungen Winke gegeben werden.

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CHILDREN'S ABILITY TO REASON

After the long vacation the teacher frequently reports to her principal or superintendent that her school needs a careful review of last year's work in arithmetic. She is likely to grow confidential and to express, with proper apologies, doubt of the ability of Miss Smith, who taught the school last year, to teach that subject.

Children frequently do good work one year and poor the next, for which the teacher is censured. These facts and the general dissatisfaction with results in teaching arithmetic have been my reasons for giving recently a great deal of thought to the course in mathematics for grades below the high school. It seemed probable that a more exact knowledge of the development of reasoning power would be helpful to us. To determine something of this I began by selecting problems which were examples of different types of comparison of numbers. These I gave to classes, noting the degree of success or failure with the same problems. When the Child Study Section of the State Teachers' Association was formed last December, it took up this problem, and after the revision of my syllabus gathered many hundred papers for me from both Colorado and California.

The syllabus was in six parts. In framing each the attempt was made to keep well within the range of work commonly given in the text-books, to make numbers so small that chance of failure on their account would be slight, and to make each exercise so short that fatigue would not be a factor of consequence. Too few results have been received on the first series to be of value, and those received on the sixth are not worth reporting.

The second, third, fourth, and fifth series, with directions given to teachers, are as follows:

SECOND SERIES—FOR SECOND AND THIRD GRADES

Perhaps not more than three of these would better be given in any one day in order to avoid the element of fatigue affecting results.

1. Four yards make 12 feet, how many feet in one yard?
2. One foot equals 12 inches, how many inches in 3 feet?
3. Four pencils cost 16 cents, what will six cost?
4. Three boys cut a pile of wood in six days, how long will it take one?
5. One boy paints a fence in 8 days, how long will it take four?
6. Three men dig a cellar in 6 days, how long will it take two?
7. Two-thirds of a yard is 24 inches, how many inches in three-fourths of a yard?
8. One pound of candy costs 12 cents, what will three-fourths of a pound cost?
9. A boy lost two-thirds of his marbles and had 8 left, how many had he at first?

THIRD SERIES—FOR FOURTH AND SUCCEEDING GRADES

1. Twelve cords of wood are 96 feet long, how long will 8 cords be?
2. Three men dig a well in 4 days, how long will it take 6 men?
3. Three-fourths of a dozen eggs cost 15 cents, what will 5 dozen cost?
4. Three-fourths of a measure of grain weighs 24 pounds, what does three-eighths of it weigh?
5. A storm broke off three-fifths of a tree; the part left was 30 feet high, how high was the whole tree?
6. Sixteen yards of silk cost $48, what will two-thirds of a yard cost?

FOURTH SERIES—FOR SAME GRADES

Use these as some test of the pupils' power to deal with conditions somewhat algebraic.

1. B has twice as much money as A; they have together $21, how much has each?
2. Five times a number is 40, what is the number?
3. Four times a number is 6 more than 48; find the number?
4. Six times a number is 7 less than 61; find the number?
5. The sum of two numbers is 30, their difference is 6; find the numbers?
6. What number multiplied by itself makes 36?

FIFTH SERIES—FOR SAME GRADES

Use these as some test for pupils' readiness to visualize conditions.

1. Two boats start from the same place and both sail up the river, one at the rate of 2 miles per hour and one at the rate of 3, how far apart will they be at the end of 4 hours?
2. If one sailed up the river at 2 miles per hour and the other at 3 down the river, how far will they be apart in 4 hours?
3. Find the area of a strip of paper 10 inches long and one-half inch wide?

4. Of a strip 2½ inches long and ⅓ inch wide?
5. Of a piece ½ inch square?

Give your pupils *no* preliminary drill for these tests. Omit no test, "because your pupils have had no such work." Ability to do many things often develops without the teacher's aid.

It will be no reflection on you if your pupils make many failures. Poor papers have often to the expert as great value as the better ones; and the absence of the poor ones may lead to wrong conclusions. All papers will be treated as confidential and no reference will be made in our report to either teacher or locality furnishing papers.

The most of what is here offered may be given the pupils as written work during the usual period of recitation. Keep from them the fact that any special use will be made of their papers. It may be well to say when their recitation period comes that they may try this work instead of reciting. Write all problems on the blackboard and ask the pupils to copy one at a time, and place their work below it. Give them *no* assistance beyond reading the problems over to them. When they are through ask them to write name, age, and grade on their papers.

Try the third, fourth, and fifth series on separate days, and collect the papers after a trial of each series.

The second and third series have the same general purposes and will be discussed together. For the second series returns are available from 286 boys and 234 girls; for the third, from 690 boys and 783 girls. These papers have all been examined and tabulated by the writer. The percentage of mistakes in multiplying, dividing, adding, and subtracting was too small to be reported.

The following tabulations show the number of children of each age and sex, percentage of error on each problem, and total percentage of error at each age:

SECOND SERIES

Age.	*Sex.*	*No.*	*Percentage failing on each problem.*									*Total, or average.*
			1	2	3	4	5	6	7	8	9	
7	Boys.	45	44	44	56	54	64	69	69	69	71	60
7	Girls.	48	38	50	62	56	64	75	79	73	73	63
8	Boys.	94	29	34	61	63	59	80	84	80	89	64
8	Girls.	67	10	28	48	58	52	79	71	63	86	56
9	Boys.	87	22	30	50	58	54	80	73	82	82	59
9	Girls.	70	10	24	38	44	40	78	54	63	81	48
10	Boys.	60	26	26	51	55	57	70	70	72	91	58
10	Girls.	49	35	35	65	58	63	79	80	75	82	64

THIRD SERIES

Age.	*Sex.*	*No.*	*Percentage failing on each problem.*						*Total, or average.*
			1	2	3	4	5	6	
9	Boys.	37	46	27	57	70	83	62	57
9	Girls.	28	43	61	61	75	75	57	62
10	Boys.	80	33	25	50	61	67	47	47
10	Girls.	88	51	43	67	77	81	61	64
11	Boys.	109	32	24	52	55	61	45	46
11	Girls.	135	25	33	55	59	72	53	50
12	Boys.	150	29	23	39	52	52	44	40
12	Girls.	153	27	22	41	54	61	45	42
13	Boys.	150	18	18	23	40	47	23	28
13	Girls.	188	23	20	35	50	52	33	36
14	Boys.	87	18	23	45	53	50	33	33
14	Girls.	107	16	25	21	33	55	23	29
15	Boys.	77	4	5	21	25	33	23	18
15	Girls.	84	14	11	22	27	33	18	21

The errors may be all heard or seen daily. Children hearing them rarely manifest suspicion of their absurdity. The following are typical of the mistakes on each problem:

SECOND SERIES

1. One yard makes 4 × 12 feet, or 4 + 12 feet.
2. Three feet equals 15 inches, or ⅓ of 12 inches.
3. Six pencils cost 4 × 6c., or 6 × 16c.
4. One boy cuts the pile of wood in 2 days, or 9 days.
5. Four boys require 4 × 8 days.
6. Two men dig a cellar in 2 × 6 days, or 2 × 3 days.
7. Three-fourths of a yard is ¾ of 24 inches.
8. Three-fourths of a pound cost 3 × 12 cents.
9. The boy had 2 × 8 marbles.

THIRD SERIES

1. Eight cords are 8 × 96 feet long.
2. One man requires ⅓ of 4 days.
3. Five dozen eggs cost 5 × 15c., or sixty eggs cost 60 × 15c.
4. Three-eighths of the measure is ⅜ of 24.
5. Three-fifths of a tree equals 30 feet.
6. Two-thirds of a yard cost ⅔ of $48.

It may be claimed that confusion resulted because these problems were placed together, and that they could have been solved if given separately. This may be true, but if

true, certainly emphasizes the children's weakness. Every teacher has many times observed children trying first one method after another for the solution of a problem, or trying the same method with a miscellaneous list of problems.

Confusion in analysis has resulted apparently in many cases from the use of long forms. I do not think that it can be said that poor teaching accounts for the errors, since the localities furnishing reports would, if named, be recognized as known to have good schools. No locality is conspicuous for either exceptionally good or poor sets of papers. The tabulation by age prevents the personality of any one teacher from affecting the results for any one particular age.

These problems are not uncommon ones. Perhaps some of these types are not given the attention they deserve in teaching, but can we assume that power develops only as we develop it!

To what extent these results are due to present methods of teaching is best left an open question now.

The failures of the boys at seven have increased at eight. There is a decrease during the next four years, greatest at nine years, counting both series. The rate of decrease of error is more rapid at thirteen and fifteen years, but at fourteen errors are nearly as numerous as at twelve.

The failures of the girls are more than those of the boys. The girls' improvement is continuous till they are ten years, when they lose power.

This is regained during the next year, and excepting some retardation at thirteen years, continues with little irregularity.

There is, all told, less irregularity in the curve for the girls than for the boys.

At fifteen there is little difference in power. The loss of power by the girls of ten years and by the boys of eight and fourteen years seems to be peculiarly significant. Of perhaps greater significance is the fact that these losses are more than made up during the year following. This suggests that poor work done during these periods need not

be reason for refusing promotion. The teacher need not necessarily be subjected to criticism, nor worry on account of the children's stupidity.

If we take into account the results for both sexes, percentage of error decreases most rapidly at nine, thirteen, and fifteen years.

The very large percentage of error with many of the problems in early years, suggests that time for these would better not be taken until much later. There seems to be a limit, yet to be fully determined, to the number of steps in reasoning each child can take.

There are many coincidences between the curves for physical growth[1] and fatigue and these tabulations. The rate of growth, which has been rapid during the first eight or nine years for both sexes, decreases greatly for the boy during the next two or three. He begins during his thirteenth year to grow much more rapidly, and continues this rate for about three years, when it decreases greatly, ceasing about twenty-one or twenty-two.

The rate for the girl slows greatly between nine and ten; generally she grows at a very rapid rate during the next three years. This rate then decreases rapidly, her growth generally ceasing between seventeen and eighteen. The boy fatigues most easily at eight and fourteen, the girl at thirteen. Brain growth and size fluctuate, says Vierordt.[2] The boy's brain has lost in weight at fourteen; at fifteen it has regained it. Other tables quoted by Donaldson, showing the rate of growth in strength, might be quoted.

The theory that physical growth and power to reason increase generally at much the same rate, unless interfered with by such factors as teething and pubertic changes, comes readily to mind.

Returns on the fourth and fifth series are available for the ages from eleven to fifteen inclusive. Papers were written by 472 boys and 597 girls for the fourth series, and by 447

[1] Donaldson's *Growth of the brain*, chap. iii.; Porter's *Growth of St. Louis school children*.

[2] Donaldson's *Growth of the brain*, p. 105.

boys and 551 girls for the fifth. The writer has examined and tabulated these also, with results as follows:

FOURTH SERIES

Age.	*Sex.*	*No.*	*Percentage failing on each problem.*						*Total, or average.*
			1	2	3	4	5	6	
11	Boys.	83	36	15	58	47	77	24	43
11	Girls.	95	45	7	55	42	66	22	40
12	Boys.	106	28	5	39	33	59	13	30
12	Girls.	117	25	3	35	29	52	7	25
13	Boys.	133	15	2	19	20	45	7	18
13	Girls.	163	12	0	26	16	58	2	19
14	Boys.	93	17	1	24	14	50	4	18
14	Girls.	133	13	0	13	13	45	3	15
15	Boys.	57	17	0	30	15	42	10	19
15	Girls.	89	16	7	21	10	42	7	17

FIFTH SERIES

Age.	*Sex.*	*No.*	*Percentage failing on each problem.*					*Total, or average.*
			1	2	3	4	5	
11	Boys.	70	33	37	74	80	82	61
11	Girls.	100	45	52	62	65	72	59
12	Boys.	102	18	27	48	52	67	42
12	Girls.	106	25	30	60	72	85	54
13	Boys.	123	9	18	33	42	53	31
13	Girls.	145	13	24	38	45	59	36
14	Boys.	86	7	22	25	30	48	22
14	Girls.	114	9	13	22	31	50	25
15	Boys	66	8	15	18	18	30	18
15	Girls.	86	5	16	17	22	45	21

The following are typical of the errors:

FOURTH SERIES

1. A will have ½ of $21, or A and B will have 3 × $21.
2. $5 \times 40 =$ the number.
3. $(4 \times 48) + 6 =$ the number.
4. $(6 \times 61) - 7 =$ the number.
5. $\left.\begin{matrix} 30 + 6 = 36 \\ 30 - 6 = 24 \end{matrix}\right\}$ the numbers.
6. $1 \times 36 =$ the numbers, or ½ of 36 squared.

FIFTH SERIES

1. $2 \times 3 \times 4 =$ the distance, or $(2 + 3) \times 4$.
2. $2 \times 3 \times 4 =$ the distance, or $(3 - 2) \times 4$.

In the last three area was confused with circumference.

An examination of the errors suggests the same comments. The percentages for the fourth series show a decided gain of power for the boys of twelve years with less for the girls. There is no less of power for either at any succeeding age studied here. Excepting at eleven, the boys make fewer errors than the girls.

In the fifth series the errors of the girls are fewer than those of the boys This seems to be in line with Galton's conclusion that women visualize better than men. After thirteen power is practically at a standstill, though with percentage of error low.

If we proceed on the theory that there are periods when a power of any given kind begins to develop and function, and that forcing it to function before its proper time is but productive of later weakness, the question what modifications are needed in arithmetic teaching is suggested. Certainly the movement for early introduction of the elements of algebra and geometry is to be commended, and also the tendency to do less number work in lower grades. Perhaps at nine and thirteen years much more time could well be given to arithmetic. Interests most dominant at other years should receive more attention. It does not appear at any stage that greater "thoroughness" in arithmetic is secured by lengthening the time given it. "Practical" arithmetic has been generally taken to mean problems involving money transactions. A very large part of popular arithmetics is filled with such work. It is very doubtful if children can reason far beyond their experience and environment. Practical teaching should utilize these, extend them, and aim more at the development of power.

In this study my associates have heartily co-operated. Dr. Balliet has made valuable suggestions.

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[redacted] the compliments of the writer.

ATTENTION: EXPERIMENTAL AND CRITICAL.

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Reprinted from The American Journal of Psychology, Vol. VII, No. 4.

Earl Barnes

ATTENTION: EXPERIMENTAL AND CRITICAL.

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Reprinted from The American Journal of Psychology, Vol. VII, No. 4.

OUTLINE. I. Some slight additions to the reported experiments on Attention. II. A brief historical sketch of the subject. III. The writer's views. IV. A summary of by-products of the experiments which suggested, and in turn get meaning from, the view held. V. Bibliography.

I.

At the outset there will be no attempt made to define Attention; the word will be used in its ordinary sense. The experiments to be described, and which were performed in the laboratory of Clark University, fall into three general groups. In the first, use was made of perception, association and reaction time; in the second, perception and association; in the third, perception only. In these groups the question set was always: What differences, if any, can be found in the results of a given task performed on one occasion with concentration, at another with distraction of attention?

A. Reaction-Time.

This series, carried on in the winter of 1893-4 and fall of 1894, aimed to combine tasks of various degrees of difficulty with distraction of various degrees of effectiveness. Its object was to arrange a series of tasks of increasing degrees of complexity which should make ever greater demands on the mind, until attention should pass from a fully concentrated to a completely distracted state. The work was begun in full sympathy with Wundt's position, and, indeed, was understood as but a mere continuation of the course begun by him and others.[1] The experiments with five subjects[2] were as follows:

I. Multiplication table up to 12×12, factors given in four sets of eighteen couplets each, in hour sittings, first and last sets with concentrated attention and signals; second and third without signals and with distraction. The distraction consisted of: reading text (1) silently, (2) aloud; naming letters (1) in direct order in text, (2) in reverse order, (3) on drum, seen one at a time; fixation of one letter seen through a slit. Further work was given also in multiplication, *e. g.*, 6×19, etc. The factors were given (1) orally, circuit closed with last factor, (2) by Fall-apparatus. Reading, for purpose of distraction, was (1) stopped when last factor was given, (2) continued until after answer was got. Reactions made by finger key and with mouth key; to be made in shortest possible time.

II. Stimuli—(a) by *Fall-apparat:* (1) letters, (2) colors, (3) diagrams, *e. g.*, crescent, star, circle, triangle, cross, (4) factors to be multiplied, (5) numbers from one to ten; (b) oral: factors and

[1] Phys. Psych., 4th ed., Vol. II. Chap. XVI, and *Mind*, Jan., 1895, p. 79.

[2] Besides the writer these were Dr. E. C. Sanford, Mr. A. H. Yoder, Mr. A. C. Ellis and Mr. J. R. Slonaker. To these gentlemen I am greatly indebted for many months of careful work.

numbers as in (4) and (5). Reactions made on five and ten-fingered keyboards were semi-adaptive, or with from one to all the fingers of one or of both hands. Stimuli were given in four sets: first and last with free attention and ready signal; second and third with distraction and no signal.

The times were taken chiefly by the Hipp chronoscope, though other methods were used. The figures obtained are regarded as unsatisfactory, though in passing it should be said they are in substantial agreement with those obtained by other experimenters working under like conditions. Greater stress is laid on the observations made during the course of the experiments on external and introspective accompaniments; rather full notes kept of these will be given in connection with similar data got while carrying out other lines of experiments.

B. Association Experiments.

Association experiments were performed in spring of 1894, to find in what degree, if any, the process and variety of strictly relevant associations are affected by concentration and distraction of attention. The material consisted of four sets of cards prepared for me, 100 in each, on which were written words, grouped as follows:

	I.	II.	III.	IV.
Common nouns,	64	57	57	66
Proper nouns,	2	4	2	6
Nouns or verbs,	21	24	34	22
Abstract nouns,	8	8	7	5
Adjectives or nouns,	4	6	0	0
Adjectives,	1	1	0	1

Each set was taken twice, with an interval of a month; the results of each first trial were not looked at nor thought about during the interval. Tables A and D show the order in which the sets were taken and repeated. Distraction was got by adding columns of logarithmic tables; five groups of these—vertical,—with five figures in each group, were taken as a stint; the plan followed was to add the first group, and while passing up to the next, to glance at the card, catch the word, and go on with the addition. The figures were at my right, the pack of cards at my left, and not to be seen save by special effort; the figures were covered either by thumb or by a card held in left hand, and were exposed singly. With concentrated attention the time allowed (fifteen seconds) was kept by a clock striking quarter-minutes. (Cf. Bergström, American Journal Psychology, Vol. VI, p. 248.) In this portion of the work the cards were on the table before me, hid by a block. As the clock was about to strike, I leaned forward with eyes on wall, and dropped them on the word at the stroke. All unrelated "associations" were ruled out, inhibited at once. At times this practice worked against the reception of some rightful though unrecognized claimants, and these, now and then, continued to press their claims until admitted, though often they were seen aright too late to be included within the time limit. After each trial the associations were jotted down, and then dropped from mind as quickly as possible. Work was usually done in hour shifts in the morning. Average time per word (inclusive of time taken to write out the associations, etc.) was with concentrated attention, 2.2 minutes; with distracted, 2.4 minutes. The latter is a little greater, but it includes the time taken to check the additions.

Because of differences in method it is impossible to make a sta-

tistical comparison with Galton's work,[1] but it may be well to call attention to the fact that Galton selected his words, and thus began with a set of associations; repetition of these would but fix them deeper. It is probable, too, that a large part of his list were suggested by matters new in his mind. As did Galton, so do we find any attempt at classification of one's mental furniture sure to be unsatisfactory. Eye, ear, and motor-mindedness may be convenient groupings in a discussion, but are inseparable in the mind. The conditions of the experiments were such as to cause a strong bias to internal speech. The words used were repeated mentally, and the process of association was with us begun often before the object for which the word stood was fairly realized; often not the object itself was got, but instead a strong sense of its location and place associates. Mere verbalisms, puns, catch phrases and the like were frequent; irrelevant pseudo-associations, *i. e.*, associations of associates, were a pest difficult to escape. It was less easy to pick out those cases wherein the eye was caught and associations suggested which were not strictly pertinent; by eye were often recalled derivatives of the root whence the keyword came,—though one could not be sure the associates did not join directly to the root-meaning. Visualization was common; localization was seldom absent. Results are as follows:

TABLE A. NUMBER AND DISTRIBUTION OF ASSOCIATIONS.

	1		2		3		4		Sum of α(1-4) a	Sum of β(1-4)a	Sum of β(1-4)b
	a	b	a	b	a	b	a	b			
I. α. Distracted Att.	116		130		74		17		337		
β. " "	52	49	87	61	44	36	15	6		198	152
	168		217		118		32				
II. α. Concentrated Att.	120		185		108		10		423		
β. " "	43	66	92	80	40	37	16	3		191	186
	163		277		148		26				
III. α. Distracted Att.	147		166		74		7		394		
β. Concentrated Att.	70	93	86	95	50	42	26	2		232	232
	217		252		124		33				
IV. α. Concentrated Att.	138		162		83		6		389		
β. Distracted "	41	89	80	92	43	36	22	5		186	222
	179		242		126		28				

1, First two-fifths of life; 2, second two-fifths; 3, last fifth, save 4, the immediate past.
a. New associations in first and second trials; b. repeats.

[1] Cf. Bibliography at end.

TABLE B. DISTRIBUTION OF ASSOCIATIONS WITH CONCENTRATION AND DISTRACTION.

	1	2	3	4	Sum	
Concentrated Attention,	371	525	281	58	1235	52.55%
Distracted Attention,	356	463	235	61	1115	47.45%
	727	988	516	119	2350	100.00%
Repeats,	297	328	151	16	792	

Table B is derived from Table A; *e. g.*, from column 1 a, 120+43+70+138 = 371; etc.

TABLE C. DISTRIBUTION BY PER CENTS.

Of the 2,350 new associations

		Concentrated.	Distracted.
30.93%	Come under 1,	15.78%	15.15%
42.04%	Come under 2,	22.34%	19.70%
21.96%	Come under 3,	11.96%	10.00%
5.07%	Come under 4,	2.47%	2.60%
100.00%		52.55%	47.45%

TABLE D. NEW ASSOCIATIONS ON SECOND TRIAL.

I. Distraction, followed by same,	337	62.99%
	198	37.01%
	535	100.00%
II. Concentration, followed by same,	423	68.89%
	191	31.11%
	614	100.00%
III. Distraction, followed by Concentration,	394	62.94%
	232	37.06%
	626	100.00%
IV. Concentration, followed by Distraction,	389	67.65%
	186	32.35%
	575	100.00%

Table D is derived from Table A, third and second columns from the right.

TABLE E. REPEATS ON SECOND TRIAL.

I. Distraction, followed by same,	337	100.00%
	152	45.10%
II. Concentration, followed by same,	423	100.00%
	186	44.00%
III. Distraction, followed by Concentration,	394	100.00%
	232	58.88%
IV. Concentration, followed by Distraction,	389	100.00%
	222	57.07%

Table E is derived from Table A. third and first columns from the right. Of 337 associates got on first trial, 152 recurred when the series was repeated a month later.

TABLE F. ASSOCIATIONS BY KIND; FIRST ASSOCIATIONS ONLY, NO REPEATS.

Concentrated Attention.

	Concrete.	Verb.	Story.	Word, &c.	Reason'g.	Sum.
II. 1 and 2,	230	28	153	114	81	606
III. 2,	87	13	41	58	33	232
IV. 1,	171	25	75	89	25	385
Sum,	488	66	269	261	139	1223
Percentage,	40	5.4	22.	21.3	11.4	

Distracted Attention.

I. 1 and 2,	214	19	143	93	48	517
III. 1,	175	34	83	76	23	391
IV. 2,	58	5	64	35	23	185
Sum,	447	58	290	204	94	1093
Percentage,	40.9	5.3	26.5	18.6	8.6	

Hampered by the conditions—in a limited time to get the greatest possible number of direct and good associations to a seen word,—the work was of course in some respects not normal. The number of associations got with concentrated is but little more than with distracted attention,—evidently because especial effort within the time limit was nearly equivalent to the distraction. Ranging was precluded by the conditions, though ranging is required in

order either to get new associations, or at least to dip into these when found. A comparison of sets III and IV, Table A (see especially the second column from the right, 232 against 186), indicates that to end an experiment with close attention enables one to clean up his scattered associations, though in several instances the commonest associates were not found. "Clock" gave me clocked stockings, but not a time-piece; "school" gave school of fish, and to school, *i. e.*, discipline one's-self, but not an inkling of the many schools attended or taught. In many cases it is difficult to satisfactorily assign the associations to their proper period of life. When they first occur—under the conditions of the experiment—they are most often fragments, nodes of a network, whose connections trouble either by lack or overabundance. One thing, however, is commonly well marked: that recent events are hard to remember when the stress is great. The period included under 4 was limited to a few days preceding the tests, and its incidents were sights, conversations and other such matters as are usually totally forgotten in a short time. Tables B and C show how slight, under the conditions, was the influence of attention. Of the determinants of association given by James (Vol. I, p. 577) recency and the oldest habits fall out in an examination of this sort.

Under D a comparison of I and III with II and IV, shows disturbing effect of distraction on first trials, since in I and III was got a less per cent. of the whole number of new associations than in II and IV. Yet an examination of the results of the second trials of the same sets shows no marked differences due to conditions of attention. In Table E, comparison of repeated associations, the most striking feature is the marked uniformity of the repeat-percentages under like requirements. The increase in the number of repeats shown in A and E, probably indicates growth in ease and habituation in performing the experiments, though it should be said that in the earlier part of the work, repeats, which returned with force, were turned down as unprofitable material, and greater effort was made to hold close to the key-word. As the work grew more familiar, the repeats were recognized, noted and passed with little trouble, and thus more of them found place in the final reckoning. Although the repeats were more or less bothersome, still from the start they seemed empty, persistent, yet worthless; as the work progressed they became less insistent, — mere echoes of the former trials. As the mind became adjusted to the conditions, the ideas which gathered about the key-word tended to form groups and to return *en bloc*. As for the addition, it soon ceased to be much of a distraction, in the sense of a source of flurry,—although when series of like or of small numbers occurred they proved to be very confusing. Accustomed to an irregular gait, both in the compulsory hunt for associates and in the addition of unlike numbers, the mind could only with great difficulty curb itself for a uniform series. Series such as 4-3-2-1-0, 2-2-2-2, or 5-1-5-1, would almost inevitably cause a break in the work. In fact the attempt to do orderly, *i. e.*, continuous, work was more distracting than the distraction, — true, of course, only because the conditions were such as to make the work an alternating one. Whether the alternation was from word to figure or from an associate back to the key-word (for it was required that each associate should be connected with the given cue), in either case irradiation, or growth of an idea, was hindered. Some words that suggested few associates occasioned slow diffusion about a centre (where the mind stuck), either through attempts at derivation, or by more or less

confused lines of reasoning. But these efforts tended to vagueness, whereas the conditions called for many and definite associations; and so it came about that fatigue, whereby the temptation to range was cut off, proved an aid to lessen the power of the distraction to control one's attention, and in this way permitted greater skipping.

A most striking feature of the work was the spatial setting given to almost all the associates save a few mere verbalisms. This localization was felt as a muscular tension toward the object named, which in turn needed a setting to give it the tang of reality. Almost equally necessary was the conscious inner arrangement of the associations, which had to be created into some muscle-tension form (usually a word) in order to be carried subject to recall. Words that offered little occasion for tangible (in the main visible) experience, and which for this reason had few concrete space locations, were usually confusing, *e. g.*, will, meditation. The confusion sprang from great familiarity with meanings which wanted concise muscular expressions; words with less used content, *e. g.*, continuity, plurality, were quickly placed in some book or conversation.

Refractory though the material was, a classification was made of it according to kind, as shown in Table F. The limits of these groups are as follows: Concrete, a well visualized object. Verb, some specific act suggested by the verb key-word. Story, recalled by key-word. Word, mere verbalisms, puns, proverbs, etc. Reasoning includes, in greater part, the cases of diffusion noted above. Examples are: with "nut" was associated Piñon Jay (*Gymnocitta cyanocephala*), which, though ruled out, hovered in the shadow until one of its synonyms—*nucifraga*—came up. "Enchantress" gave me *Circæa lutetiana*, the enchanter's night shade, and set my thoughts as follows: Night shade—a poison—poisons act on the body—so do Circean smiles; then came a vague notion of James' theory of emotions, and of controlling one by his emotions. The propriety of admitting this last group (reasoning) may seem questionable because its examples were not so directly referred to the key-word, yet in truth it is hard to say how many of even the verbalisms were got by a movement straight from the stimulus.[1]

C. Least Interval.

In the American Journal of Psychology, Vol. VI, is an article by Miss Alice J. Hamlin on the "Least Observable Interval between Stimuli addressed to Disparate Senses and to Different Organs of the Same Sense," wherein, pp. 572-3, are noted results of experiments with forced attention, and the conclusion "that voluntary attention is ineffective." The experiment of perceiving closely following stimuli with concentrated and distracted attention, was continued by the writer, with results as follows:

The apparatus used was composed of the pendulum circuit-breaker[2] in connection with (a) two telephones worked by the secondary circuits of sliding induction coils; (b) iron cups filled with water, into which were plunged the fore and middle fingers of each hand—shocks mediated by induction coils; (c) for a few trials a contrivance to produce a snap, when the stimuli were a shock to a hand and a snap by one ear, made as the current jumped a break. The interval for the click and also for the shock experiments was 24σ; that for the click-shock series was 31σ. In the case

[1] See also results of experiments on S. given in a note at the close of this article.
[2] American Journal Psychology, VI, p. 581.

of the former the interval was not "the least" which could have been used, but was taken because a range was desired within which attention could be manipulated; the interval used in the click-shock experiments was probably a little too short, as will be shown in another place. Our custom was to give an equal number of stimuli in R-L and L-R order, though of irregular sequence, in sets of twenty, save in the variable series, where forty made a set; each trial was preceded by a warning signal (click of a telegraph sounder) to ensure the subject's readiness. Operator and subject were in separate rooms, with only telegraphic connections.

1.

Work began with stimuli to separate organs of the same sense, in this case with clicks of medium intensity.

1. MEDIUM CLICKS.

DATE.	SUBJECT.	INDIFFERENT ATT.		DIRECTED ATTENTION.			
		R.	L.	Right First.		Left First.	
				Att. right.	Att. left.	Att. right.	A. left.
Feb. 20-Mar. 8.	S.	75-87	75-80	49-41	44-59	43-88	43-75
Feb. 20-Mar. 7.	D.	100-90	100-72	53-57	50-90	46-87	54-50

In each column the figures first given represent the number of trials, the second set represents the percentage of correct answers.

With indifferent attention appears a trend to the right in both subjects. Both subjects also show that attention lessens the number of correct answers for the attended side. Attention to the left enables S. to overcome the bias to the right shown in the indifferent set; D. shows a strong tendency to go opposite the direction of attention. These features prevailed more or less throughout the work and will be commented on later.

Although the stimuli were adjusted so as to appear equal, and were tested before each sitting, yet they were almost always modified by subjective influences; for a time we were continually stopping for tests to see if the apparent differences in intensity were due to objective causes, and in order to neutralize any unavoidable differences in the apparatus, the terminals, telephones and cups were interchanged by sets, so that stimuli, *e. g.*, to the right side, should come an equal number of times through each terminal. As this matter of intensity played so large a rôle in the formation of order-judgments, our next experiment was with alternating series of medium and faint clicks—attention indifferent, since our aim was to get the naïve bias, if any. Of each group of four sets of twenty each, one and three—medium and faint respectively—were taken by one subject, two and four, duplicates of the other pair, by the second subject. Whilst as thus coupled there was much introspection on the "faints," yet when set off in series these were treated by the subjects apart from and with no conscious reference to the louder series.

2. CLICKS: MEDIUM AND FAINT. INDIFFERENT ATTENTION.

DATE.	SUBJECT.	MEDIUM.		FAINT.	
		Right First.	Left First.	Right First.	Left First.
Mar. 6-8, and 13-23.	S.	120-83.3	120-86.6	120-75.8	120-80.8
Mar. 6-8, and 13-23.	D.	120-81.0	120-78.0	120-79.0	120-70.0

In this group there is no trace of any bias to the right in S.; in D. it remains.

Continuing the comparison of intensities, we arranged the induction coils so they could be varied at the pleasure of the operator,—though the range of variation was limited to what was noted by each subject, *when testing*, as "just observably different." The series were short, and gave results as follows:

3. VARIABLE CLICKS: INDIFFERENT ATTENTION.

DATE.	SUBJECT.	Right First.		Left First.	
		R. Loud.	L. Loud.	R. Loud.	L. Loud.
April 5-10, June 10-19.	S.	79-63	79-75	78-77	79-72
April 6-10, June 10-12.	D.	45-11	49-86	45-96	48-58

Both subjects give preference to the faints; with D. the habit is extreme.

The electric-shock stimuli were used under the same general conditions of interval and order that governed in the use of telephones; the results of the main series are as here given.

4. SHOCKS: MEDIUM.

DATE.	SUBJECT.	INDIFFERENT ATT.		DIRECTED ATTENTION.			
		R.	L.	Right First.		Left First.	
				Att. right.	Att. left.	Att. right.	A. left.
Apr. 12-May 9.	S.	200-93	200-45	103-86	97-76	97-41	103-64
Apr. 12-May 8.	D.	200-80	200-70	90-82	110-71	104-61	96-60

Note the bias to the right, especially in S. To direct attention to shocks is a very different matter than in the click series; this matter will be treated further under the introspective comments. In the same section will be noted an interesting illusion, found while we were working with crossed hands.

In order to test a lurking inference that voluntary attention did not aid, and possibly hindered, judgments of the time order, a few series were taken with "distracted attention," got by reading aloud, at a rapid rate, interesting "short stories." Each series was preceded by one of the usual kind—indifferent attention—in order to tune up our minds. The indifferent series was preceded by the customary ready signal; the stimuli of the distraction sets came unawares and at irregular intervals.

5. SHOCKS WITH DIVERTED ATTENTION:

DATE.	SUBJECT.	INDIFFERENT.		DIVERTED BY READ'G	
		R.	L.	R.	L.
May 30, and June 7-8.	S.	40-58	40-53	60-73	60-53
May 30, and June 7-8.	D.	50-64	50-60	60-75	60-61

The only effect seems to be to give the bias to the right greater play and thus to increase the whole number of correct answers on that side.

As with the clicks, so with the shocks were taken series with variable intensities. With one exception, when right led for D., both subjects went with the fainter intensity. But the series are too short to be more than suggestive.

6. SHOCKS: UNIFORM AND VARIABLE.

DATE.	SUBJECT.	UNIFORM, MEDIUM.		RIGHT FIRST.		LEFT FIRST.	
		R.	L.	R. Strong.	R. Faint.	L. Strong.	L. Faint.
June 20.	S.	20-55	20-55	20-60	20-80	20-50	20-80
June 20.	D.	20-85	20-80	20-60	20-55	20-65	20-80

2.

By means of telephone and cup, stimuli were given to disparate senses, one ear and the fore and middle fingers of one hand. The interval used was 31σ.

7. SHOCK AND CLICK.

DATE.	SUBJECT.	INDIFFERENT ATT.		DIRECTED ATTENTION.			
		Shock.	Click.	Shock First.		Click First.	
				Att. on S.	Att. on C.	Att. on C.	Att. on S.
June 13-18.	S.	100-91	100-51	94-93	106-79	94-71	106-75
June 13-18.	D.	100-98	100-19	103-76	97-99	103-38	97-85

The most prominent feature of this series is the influence of directed attention to even up the very unequal portions got with indifferent attention. The readiest explanation of the facts is that the interval between stimuli was too short to permit the mind to adequately judge the order in the indifferent set, and that in the press the stronger, *i. e.*, more expansive, shock overbalanced the click. The interference of attention aided D. in that it served to turn his judgments in the contrary—and usually correct—direction.

It may be of interest to note the inner uniformity of the various series, and to this end the following tables, 8-11 inclusive, are submitted; figures give percentage of correct answers:

8. CLICK SERIES BY HALVES.

SUBJECT.	INDIFFERENT ATT.		DIRECTED ATTENTION.			
			Right First.		Left First.	
	R.	L.	Att. Right.	Att. Left.	Att. Right.	Att. Left.
D. I.	88	72	64	92	96	38
D. II.	92	78	52	88	61	92
S. I.	100	71	53	57	86	86
S. II.	75	86	21	62	90	58

9. SHOCK SERIES BY HALVES.

SUBJECT.	INDIFFERENT ATT.		DIRECTED ATTENTION.			
			Right First.		Left First.	
	R.	L.	Att. Right.	Att. Left.	Att. Right.	Att. Left,
D. I.	75	62	87	62	60	64
D. II.	85	78	78	80	61	57
S. I.	91	57	80	78	51	67
S. II.	95	33	94	75	33	60

10. CLICK AND SHOCK SERIES BY HALVES.

SUBJECT.	INDIFFERENT ATT.		DIRECTED ATTENTION.			
	S.	C.	Shock First.		Click First.	
			Att. Shock.	Att. Click.	Att. Click.	Att. Shock.
D. I.	96	18	78	100	24	82
D. II.	100	20	74	98	51	96
S. I.	90	52	96	84	67	71
S. II.	92	50	89	75	76	80

11. SERIES BY HALVES COMPOSED OF FIRST AND SECOND TEN OF EACH SET.

SUBJECT.	SERIES.	INDIFFERENT ATT.		DIRECTED ATTENTION.	
		I.	II.	I.	II.
D.	Clicks	77	79	70	73
D.	Shocks	75	75	67	70

3.

What, now, has introspection to say as to the subjective features of the work? Foremost is the fact, for D. at least, that the order of discrimination is from whole to parts; as the stimulus is repeated it grows in complexity. Other things being equal, in each new series and in every variation of a series, the judgments came promptly at first, and with a feeling of certainty that was fairly justified. But the feeling of ease passed away as introspection burrowed and disclosed differences before unsuspected. So it was that as we worked on, introspection notes accumulated at a growing rate, and we came at times to doubt the worth of series which actually showed a good preponderance of correct answers. Despite the fluctuations, however, two chief methods of judging were used: (1) A relatively immediate, sensory way, called "alert indifference" by Miss Hamlin (p. 574), and (2) a relatively conscious and reflective way. "*Relatively*," for we were not ordinarily conscious of such forms; whenever a case got loose from its immediate sensation-feeling, and thus made its order a matter of pure judgment, it was rejected, and the stimuli were repeated. Records were kept of these repeats (which do not figure in the tables given, and which were at times many), but as yet nothing definite has come from their study. For reasons to be given later, I believe these two forms of judgment to be stages of one process; nevertheless, to introspection the former is passive, the latter has a shade of action. Of the latter there are

two well-marked kinds, *a* and *b*. Mention has been made of the subjective differences interjected into the sensations by causes and ways thus far untraced; directed attention complicates the matter, but the reference now is to the indifferent attention sets, and chiefly to the fact that the intensities of each pair of stimuli differed subjectively, fluctuating capriciously both in degree and order. For a while the struggle—in cases when judgment lagged—was between a "feeling" and a "time" order, the two kinds listed above, *a* and *b*; introspection brought out that this time order depended on the relative intensities of the stimuli, which in turn were controlled by conditions of (1) end-organ responses, (2) general body state. One form of reasoning that slowly grew clear was: The two stimuli are objectively equal; subjectively they are unequal. One is fainter, hence farther away. But it cannot be more distant in space, hence it must have preceded the other. Another line of thought was: Into a uniform state of alert indifference or expectant attention comes a stimulus which, with a clear field, seems strong. Hard after the first comes a second, which by contrast seems faint. D. found himself controlled by the former—prejudice or bias rather than course of reasoning; S., and especially several on whom side tests were made, followed in part the latter. It should be kept in mind that the sensory, *i. e.*, passive, form—when got—furnished the most satisfactory results, because so free from any perception-fringe. An extreme of this form is found in the common experiences of life when two stimuli are separated by so great an interval as to leave no chance for doubt as to their order. The same feeling of sureness of order which accompanies the perception of well separated stimuli was present now and then, sometimes relating to isolated cases, again extending to whole series; yet the subjects at times were confident of what were, in reality, faulty sets, and again doubted correct ones. The individual cases checked immediately by D. as surely correct, give results as follows: (In each couplet the first number gives the whole number of cases checked "sure;" the second number gives the per cent. of correct answers.)

12.

Indifferent Attention.	Directed Attention.	Distracted Attention.
250-82	155-79	28-93

The freer one's mind is of anticipations of the stimuli, the better are his judgments.

The sensory form, recognized as purely passive, of course was beyond our control, and to be got only by a happy combination of circumstances. But commonly it was easy to sense the things we ought not to have done, for these were willful, though well-meant, interferences with perception. To direct attention is not an easy matter when one is prone to over-much introspection. Concentration on an ear was characterized by a strain in the ear muscles, and another, with a sense of looking fixedly, about the eyes. Attention to a hand often degenerated to a stupid stare until the plan was formed to slightly raise the hand, as if "hefting" it, at the same time slightly innervating the fingers. By this means attention was known to be *in* and not merely toward the hand, and "inner" and "outer" attention were made to coincide. The state known as

alert indifferent attention is really a state of general qualitative attention (for irrelevant matters are unheeded), with a focus of concentration in the median plane. Often during a series, as fixation grew more exact, what was at first a mere point of regard became a surface like the saddle-backed "specious present." The subject felt that the slightest wavering of attention to one side the imaginary centre would cause a bias in judgment to the favored side; then the criticism spread to his head, eyes, shoulders, and even to the equal expansion of the lungs. Because of this irradiation D. continually shifted his focus, ranging from a spot on the ceiling to one on his neck-tie, and tried some series with closed eyes. S., on the contrary, clung, as a rule, to a spot on the table at which he worked. Of the whole number of trials with directed attention, D. had 69% correct to S.'s 71%.

As might be expected in this interplay of fixation strains, there was now and then a passive state when the sensory form of judging found entrance. In truth these sensory judgments may safely be taken to mark the only times when attention was really alert and neutral, and the other cases, even of those in the nominally indifferent series, belong to more or less conscious work, as characterized by tensions. D., more troubled by introspective fancies, began early the practice noted above of putting himself into varying attitudes in order thereby to get new mental states, since the latter proved more favorable to the presence of the so-called passive judgments. S., on the other hand, was not troubled greatly by introspection until well on in the work, when he, too, became conscious of what seemed determining factors in the formation of judgments. A result of the change of method in his case is shown in the following table by the difference in the percentage of correct answers:

13. TABLE TO SHOW RESULT OF A CHANGE IN METHOD OF JUDGING.

DATE.	CLICKS.		DATE.	SHOCKS.	
	Indiff. Att.	Direc. Att.	Apr. 12-May 9.	Indiff. Att.	Direc. Att.
Feb. 20-Mar. 8.	83%	66%	First half.	74%	69%
June 11-19.	61%	67%	Second half.	64%	65%

Comparison of the earlier and later click series shows the superiority of the naïve form. The shock series, which came between the two click series, aids in tracing the gradual loss of the sensory form. In the first half the indifferent sets were judged largely by the sensory form; as the work progressed it became increasingly conscious. The different series as a whole show a growth in consciousness and *pari passu* of one's unfitness to serve as subject for such experiments as the present. We knew too much to be fit, although we worked exceedingly hard toward the end; the effort, probably, was what spoiled the work.

Because of our desire to be as free from bias as possible, we refrained in our conferences from the discussion of our introspective tendencies. For this reason exact comparisons of individual series

is impossible. But inspection of the tables, especially of No. 7, shows that one effect of voluntary attention is a falling off of the number of correct answers to the side or stimulus previously favored, and generally a marked increase to the side or stimulus before at a disadvantage. The result is, in part at least, due to interference with a physiological bias, and is accompanied by a change in the method of judging. Attention, when stimuli are to same sense, decreases the probability of correct answers; when to disparate senses, increases the probability.

14. PERCENTAGE OF CORRECT RESPONSES WHEN STIMULI ARE TO

SUBJECT.	SAME SENSE.[1]						DISPARATE SENSES.					
	Indifferent Att.			Directed Attention.			Indifferent Att.			Directed Attention.		
	Right.	Left.	Av.	Right.	Left.	Av.	Click.	Shock.	Av.	Click.	Shock.	Av.
S.	95	80	82	72	62	67	51	91	71	74	82	73
D.	78	70	74	80	63	71	19	98	59	61	87	74

This table must be taken with the following, which shows the

15. NUMBER OF TIMES WHEN JUDGMENT OF ORDER

COINCIDED WITH DIRECTION OF ATTENT'N.							WAS OPPOSITE THE ATTENTION.							
Whole number cases.	Subject.	Clicks. Correct.	Shocks. Correct.	Crossed hands.[2] Correct.	Average of the three series.	Click and shock. Correct.	Subject.	Clicks. Correct.	Shocks. Correct.	Crossed hands.[2] Correct.	Average of the three series.[2]	Click and shock. Correct.	Whole number of cases.
466	D.	56-82	205-64	69-57	66	136-88	D.	104-65	195-71	11-56	68	284-67	594
	S.	83-54	206-75			188-82	S.	77-73	194-59			210-77	

A little more than a fourth oftener, the judgments went counter to the direction of attention, though there was a slightly greater number of correct answers with than against—72% and 68% respectively. But with such results it is in place to ask, what are the results of voluntary attention? They are complex. (1) There is a general tendency to throw doubtful cases in the direction of the attention. In numbers of places the introspective note added to the subject's order-record is, "Uncertain; go with attention." (Unless there was good reason, objective or subjective, for the rejection of a trial, it was checked, even though

[1] Sum of click and of shock series.
[2] See p. 550. First number of each couplet gives the "number of times"; second number, the per cent. of correct answers.

the order-judgment was obscure; else should we never have finished a set after our critical mood was well seated.) Yet doubtful cases were little if any more prevalent in the state called "directed" than in that called "indifferent;"—as shown by Table 12, the number of "sure" answers is but three per cent. greater in the latter. The notes of S. lead him to infer that high grade, *i. e.*, very well concentrated, attention, tends to draw the judgment with it; his figures are as follows, for the click-shock series only:

16.

High Grade of Attention.				Low Grade of Attention.			
Shock First.		Click First.		Shock First.		Click First.	
Att. Shock.	Att. Click.	Att. Shock.	Att. Click.	Att. Shock.	Att. Click.	Att. Shock.	Att. Click.
29-100	27-67	17-59	36-89	65-89	79-84	89-79	58-60

Yet, as has been so often said, our record was a growing one, expanded as difficulties arose; hence it does not extend alike to all the series. What we should have passed as unquestioned good attention at one time, a month later would be found seamy. D.'s record, so far as available, for cases when the attention was felt to be good and the order of judgment was with the attention, shows 93% of correct answers as against 74% correct when judgments went counter good attention. (These are from cases listed in Table 15, and are characterized by a good degree of concentration. They differ from the cases recorded in Table 12, also, in that those have reference to certainty of judgment.) At first the record seems to make good a claim that attention is an aid, but comparison with the "Distracted Attention" series—Table 12—shows another 93% got under conditions the opposite of attentive.

(2) The most marked subjective effect of directed attention, for D. at least, was the weakening of the stimuli. Ordinary attention to a stimulus is usually accompanied by an increase in the relative prominence of the latter in consciousness,—for simplicity, say its intensity; (we will leave aside any reference to, *e. g.*, dreaded danger which vanishes when bravely met). When the stimuli, clicks or shocks, were tested, preliminary to the regular series, to ensure likeness, they were easily compared and equalized. Then, as the experimenting went on, it became increasingly difficult to sense them, especially the faint ones. This loss was not due to fatigue, *i. e.*, to exhaustion of the part concerned, because a return to the test-attitude of mind revived the stimuli. That it was the result of an attention-strain seems evident from a study of the growth of the introspection notes. In the early part of the work, stops to overhaul the apparatus with the intent to find in it an objective cause for intensity-variations, were frequent; but when fairly in on the shock series, we found that to throw the attention well into a hand was equivalent to diminishing the intensity of the stimulus to that hand. Not that this result always came, for there are several comments of surprise at pairs that came equal or even with intensities the reverse of that noted above. When we reached the click-shock series, the influence of attention was very marked. The

indifferent series indicates an almost complete subjection to the shock; but when attention was given the hand, the shock-stimulus was usually weakened, and at times to so great an extent as to leave room for doubt whether it had really been sensed or only expected. The only series from which can be taken individual cases specifically noted, is the click-shock one, as follows:

17. TIMES WHEN ORDER WENT

SUBJECT.	WITH ATTENTION AND		AGAINST THE ATTENTION AND	
	With Faint.	With Strong.	With Faint.	With Strong.
D.	32	5	17	91

In this click-shock series the case for S. when the shock leads, is like that in the shock series (Table 5), and when the click leads, like that in the click series (Table 1). That is, in the former the number of correct answers and the direction of attention go together; in the latter they separate. The same is true for Miss Hamlin (in unpublished tables), but not for D., who varied his attitude often, but held to the original bias of faint intensity and priority. Because of this bias to "faint, therefore first" (p 545), a likeness marked as most appropriate suggested itself to Cinderella,—quiet before her assertive rivals, yet recognized finally, by her quality, as the true leader. Probably the comparison is only an elaboration of the struggle present from the outset, between a "feeling" and a "time" order, *i. e.*, faint and strong intensity.

The occurrence of the ghost-like after-image of the shock which persisted in the hand until it was given notice, though the original shock had been ignored, marks for introspection a difference between the so-called inner and outer forms of attention, — because the after-image (and oversight of its original) was most common when attention was most strongly concentrated on the hand. So far as inner attention is concerned, the appended table shows that with D. the judgment goes with the direction of attention. When stimulus and attention are on the right side (left hand), or *vice versa*, by making many wrong answers for the opposite side, the subject raises the number of correct answers *with* attention, to a good figure. But the particular difficulty found in this series lay in the location of the shocks, a feature that comes out more markedly in the trials with indifferent attention. In order to get 137 answers to a R. first series, there were given 285 trials; to get 144 answers to a L. first series, were given 247 trials. The shocks would not remain in the hands, but they gravitated to or toward the median plane. At times their fusion was complete on the Cyclopean eye order; very often it was partial, as when the right-side shock remained in place whilst the left-side shock approached it more or less.

18. "CROSSED HANDS" SERIES.

SUBJECT.	INDIFFERENT ATTENTION.						DIRECTED ATTENTION.									
	R. First.			L. First.			Right First.					Left First.				
	a	Ans.	b	a	Ans.	b	a	I	b	II	b	a	I	b	II	b
D.	285	137	89	247	144	67	50	26	20	24	5	47	23	1	24	19

a, Number of trials; *Ans.*, number of answers; *b*, correct answers; I, attention to right; II, attention to left.

Of the cases of total disappearance of stimulus there were on the right side (*i. e.*, from left hand), forty-two; from the left side (right hand), sixty-six. Twenty-one of these disappearances came in groups of three or more; the remainder were scattered or in couplets. The total loss of one stimulus is probably the extreme of translocation. The illusion is probably due to the fact the median plane is the most favorable region for sensory focus; here, or in right-handed people when confused a little to the right of it, would be projected ordinary stimuli sensed under unusual conditions.

In general it may be said of this section of our experiments that voluntary attention aids one to break up the course of his normal errors, or constant bias (cf. Tables 4 and 13). Aid is got by attending to the weaker stimulus of a pair given to disparate senses (cf. Table 7), because so to do is to inhibit in some degree the response to the stronger. It does not follow that results will be bettered by this attention; that can be seen only when the entailed disturbance ceases and action becomes again uniformly adjusted. For example, in the single-sense series "inner and outer" attention were normally balanced and the judgments were fairly correct. But in the disparate-senses series it was necessary—to attain an aim—to shake off the dominance of the shock; any means to do so would have the result got—of equalizing the number of answers for the two senses. In this way is it that attention is so effective in producing illusions, inverting time-order and the like, because the process set up by its interference is unlike the ordinary procedure it disturbs. Manifestly, attention may confuse as well as make clear. The disturbing effect of attention's strain to be inferred from the tables given, is confirmed by two side series carried on with Mr. G. W. A. Luckey, using medium and faint (*i. e.*, just perceptible) clicks, R. and L. leading in irregular alternation. The subject aimed to hold himself "alertly indifferent" throughout the series.

19.

MEDIUM.		FAINT	
Number Given.	Per Cent. Correct.	Number Given.	Per Cent. Correct.
500	83	460	76

To get the faint clicks it was necessary for him to tense to a high degree, and this effort brought on a fatigue of "indifference" which was fully as exhausting as one from great "concentration." As the muscles of response tired (from whatever cause), the consciousness dulled. In connection herewith may be inserted a statement of the whole number of correct answers given by S. and D. in all the series under discussion.

20.

Subject.	Indifferent Attention.	Directed Attention.
	Per Cent. Correct.	Per Cent. Correct.
S.	70	70
D.	76	69

If we extend our survey to the three sections under which our experiments were conducted, it is safe to make the following statements:

1. Attention is an aid in those reaction-time experiments in which the aim is to reproduce a given series—be it muscular or associational,—because in these the general conditions, as well as the especial incidents which a subject soon comes to make use of, serve to give cues. Thus one is enabled to "perceive the probable," and the expedited reproduction of the anticipated response at times leads to the *vorzeitige* reaction.

2. Attention may or may not aid in association, or rather, in the recall of associations, when we take note only of quantity. When regard is given for the presence of familiar associations, such as would be expected to appear first in ordinary stages of attention, the attention strain proves a hindrance.

3. Active attention is a positive detriment in new work whose cases must be decided each for itself. The kernel of active attention is prevision, and always prevision of an act. If the strain be great enough, instead of facilitating perception, it weakens the intensity of the first stimulus and thereby makes it other than what we await.

We may go further and characterize as disadvantageous attention when applied to the details of any work, in so far as regard is had for quick and correct execution; for acts that can be done quickly are habitual,—any interference with them, by means of attention, is in its very nature the putting of undue stress (or tension) on one link. In brief, attention is an aid to speed and surety only when and in so far as the conditions are the reproduction of a known series, *i. e.*, the reinstatement of the probable; and it is thus helpful only when the conditions converge on the few possibilities that are to be given. Active attention aids in attaining new conceptions by interfering with a habit series, thus making possible a change in direction of discharge. Passive attention aids by suspending actions that if under way are possible diversions, thus giving the stimulus a clear road to follow in the most habitual mode. The two are phases of every act, and are meaningless apart; nor can one be sure, in strange conditions, if his attention effort will be profitable or the reverse.

II.

Before continuing further the discussion of observations made whilst carrying out these experiments, it will be well to review briefly the problems of attention as these are now formulated. For the present purpose it is advisable to restrict our historical survey to the empirical psychologists, and of these to begin with Condillac, because of his elaborate theory.

Fancy a statue, says Condillac, built within on the plan of a human body, but with all inlets (senses) closed, and under the control of a master who opens them at pleasure. The statue is in every respect like a man, save it is absolutely devoid of ideas. By manipulation of the sensations ideas are built up, for judgment, reflection, desires, passions, etc., are only sensations which transform themselves differently (1-pp. 39, 40). The first sense opened is smell. The statue, modified by contact with an odor, knows a new state, though what this is, in our terms is unknown. With this sensation and the knowledge of it, appears also attention; to sense, know and attend to are one and the same. Henceforward experiences are attended by pleasure and pain (1-pp. 44, 45). In an analysis of the faculties of the mind, Condillac distinguishes between a general view of a landscape and a discernment of a particular object in the scene. This look, by which the eye tends to the object on which it is directed, is an action; for this reason it is called attention; this direction of the organ is the only part the body has in attention. On the part of the mind, attention is one sensation, experienced as though it were the only one, *i. e.*, it is an exclusive sensation. Comparison is a double attention (2-pp. 363, 364). To return to the statue: The odor which the statue senses does not vanish so soon as its source ceases to act on the nose. The attention given it retains it, *i. e.*, there remains an impress more or less strong, in accord with the degree of attention. Behold the memory! (1-pp. 48, 49) Possessed with a memory, the statue is a person, though all his psychic life is expressed in terms of smell (1-p. 89); this individuality is shown in the use of the personal pronoun. Why does the statue say I? Because we think only in words. Language is expression, and the elements of the language of action are innate (2-pp. 401, 402). Since the mind can never get away from sensation (1-p. 3), the work of reason is to clear up what was implicit in former experience. For, while the first sensation-contact does not produce a full idea, subsequent ones do so, and these, he assumes, know as we know them (1-p. 89). Evidently Condillac confuses contact, sensation and perception, and by piling up many of the first, believes himself able to produce the last. Looking as he did for all plus to come from without, he puts attention at the gate, and sees its presence in the action, as shown in the adaptation of the sense-organ that conditions the reception of an impression. This readiness is an integral part of the sensation, and the more exclusive the sensation, of necessity, by definition, the greater the attention.

It is easy to cross-question Condillac into confusion. If the statue knows its new state, why should it not know its former condition, prior to all sensation? Evidently the "I" that marks the advent of personality is not a smell term. His explanation of the origin of memory is rank tautology. Yet he helped set the trend of interest in mind-study toward the expression side, and experimentation, while it has made ground for the science of psychology, has also helped to make clear the unsoundness of some of the earlier assumptions.

Speaking broadly, we may say those who yet hold views on attention like Condillac's, know little of experiments; for them there is no need to demonstrate psychic power.[1] This point should be kept in mind, for too commonly it is assumed that experimental psychologists are not psychologists at all, but physicists who are anxious to reduce all life to terms of motion. But the distinction felt by Condillac, between consciousness and its content, though blurred in his words, is quite as real as is the intimate body-mind connection he noted, and these two phases are inseparable in any full study. At first the experiments in psychology were scattering. Bessell's solution in 1822 of the personal equation, Helmholtz's measurement of rate of transmission of an impulse through a nerve, 1850, Fechner's "Psycho-Physik," 1860, and, finally, Donder's work in 1861, are matters that serve to show how the problem of attention, as a subject for experiment, gradually came to the fore. Fechner was a pretty thorough-going advocate of the Attention-is-in-the muscles theory, and from the appearance of the Psycho-Physik there was much work done in German psychology which involved the use of attention. "Since the suggestive dissertation of Herbart in 1822 *(De Attentionis mensura causisque primaris)*, attention has come to play a very important rôle with psychologists, with whom it has had much to do in undermining the theory of faculties, until, as is known, with Wundt it may be called the central psychic category."[2] In 1873 Exner published his *Experimentelle Untersuchung der Einfachsten Psychischen Processe*, in which great stress is laid on attention. Besides the studies of Helmholtz, there appeared within the space of a few years the advance guard of the host of modern psychologies: Delbœuf, 1872; Hering, 1861-75; Brentano, 1874; and in 1874 Wundt's first edition.

Wundt's aim was to make psychology explicative, and for this purpose he made use of measurement. He starts from the psychic side, and his interest is chiefly in the unification of experience, his "Apperception." "One might say the last great step in Psychology was taken when Wundt pointed out the incompleteness of the English Association theory," says Lange (p. 395). To Wundt the natural expansion of the unitary nature of mind constitutes reason, and by definition of its nature, precludes the possibility of thinking more than one thought at a time. His psychology rests on this, that there is a physiological, or unconscious, basis for sensation; once given sensations, *i. e.*, psychic facts, and reasoning is inevitable. The impression I get is that Wundt makes little of the "unconscious" as a field of study. He calls the muscular form of reaction a pure reflex, destitute of any psychic worth (1, II p. 310), and though he hopes we may learn more of the "physical dispositions" left by sensations, he doubts if their study can throw light on the origin of the "psychic dispositions" (4th ed. II, 265). In the first edition (4th Abschnitt, 18th Capitel) he holds that the elements which are yet without (on the nascent side of) consciousness do not have a unity. Despite the fact that ideas seem to pop into consciousness fully formed, their unity is given them by consciousness only. Wundt is not one who believes in a stream of thought; the break between the apperception of *A* and that of *B*, he says, is due to the fact the mind must turn from *A* to *B*; and again, our perception of time is due to the nature of apperception,—the mind must go in jumps (4th ed. II, 429f.). In the first edition (p. 717) we read: "Because in the synthesis of feelings *(Empfindungen)* and in

[1] *Vide* Spencer's "Inadequacy of Natural Selection," *Pop. Sci. Mo.*, XLII, p. 801, n.
[2] G. Stanley Hall, *Mind*, 1883, p. 177.

the association of ideas *(Vorstellungen)* consciousness comprehends itself as active, that outering of it arises which we call attention. Manifestly in any moment consciousness has not made equally prominent all the inter-relations of ideas, but has turned almost exclusively to a few. This feature may with advantage be compared with the action of the eye, and the focusing of consciousness be called inner sight." At this time, it seems, Wundt's ideas were simple; attention was the expression (in muscles) of the working of consciousness. But the fourth edition reveals how little importance he attaches to expression, and how fully he is under the spell of his *Blickpunkt* figure. Just how many and what parts of the process whereby sensations are received and elaborated are physiological—according to his theory,—Wundt does not make clear; but to him, now, attention is a feeling which accompanies psychic activity, and feelings thus far are treated by psychologists in a cursory fashion—in lump. This activity which underlies is apperception, a strictly psychological fact, and to it Wundt devotes his study; the physiological accompaniments, so called, get little of his notice. Sufficient for him is it that apperception and not the intensity and *quality* of a stimulus determines the line of sight (I, II, 121). Consciousness is a *Blickfeld*. Wundt assumed his inner force, and busied himself with experiments to determine how rapidly it could act under certain factitious conditions. His consciousness is closely held to his inner *fovea*, and to use his own expression, what exists outside the circle of clearest vision, is ignored; of ideas outside clear consciousness we can say nothing, save historically.

Coincident with Wundt's first edition is G. E. Müller's *Zur Theorie der sinnlichen Aufmerksamkeit*, a study which emphasizes the difference between outer and inner attention, and finds the former to be dependent on the latter. Dualistic interaction must, on rational grounds, be possible (p. 3). Not the objective intensity of the stimulus-effect, but the perception, is increased by attention (p. 4). Sense-attention is the reinstatement of certain conditions of the sense-organs (p. 50). If nerve-cells can act on mind, then mind can act on nerve-cells; since mind can act on motor nerves, it is reasonable to suppose it can act on sensory nerves (p. 3). Images or vibrations travel down sensory nerves and modify incoming sensations (pp. 86, 87). A mental state in possession of the field can bar out rivals. In voluntary sense-attention the mind consciously gives the desired adjustment to the sense-organs; but objects have the power to suggest the same adjustment which is made involuntarily by the mind (p. 110). These extracts serve to give fairly well the general standpoint of the Leipzig school. Sense-attention is a minor matter to psychologists, and is dependent on inner initiative.

In 1888 Nicolai Lange published his *Beiträge zur Theorie der sinnlichen Aufmerksamkeit und der activen Apperception*, in which he more definitely stated the subordinate value of sense-attention. Were it not for the mental power to attend to faint impressions and to ideas, our minds would be open to all the blasts of experience; in which case even the sense-impressions themselves would have no meaning, because of no interpreter at the center (p. 391). Active attention consists in intensifying one idea-complex by the aid of another; it acts after ideas are in the mind. For long no other explanation was given why attention flickers than: it is the nature of apperception so to do. It was said the fixated idea was held by an act of will; or, that opposing ideas were inhibited. Lange passed by these reasons, and endeavored by experiment to show the variations were due to the coming and going in the mind of images of the fixated stimulus. Sense-attention, then, consists

in the assimilation of a sensation by its corresponding memory image which has been actively recalled. These images can be recovered actively only by means of voluntary innervation or movement impulses which are associated with them. This process we call active apperception. The variations in active apperception are conditioned by the general relativity of psychic phenomena, and form the cause of all other periodicities in consciousness, such as are expressed by sense-attention in the time-sense and in the periodic phenomena of memory (pp. 421-422). This theory of sense-attention (which Wundt adopts), demanding an inner image, to which the sensation is assimilated, is the old problem of perception, and reminds one of Parmenides' "Like is known by like." Probably in Wundt's mind the resemblance is only superficial; but I find it hard to get Wundt's position clearly.

Ludwig Lange, in the same volume of the *Studien* (IV, pp. 479-510) published a report of his *Neue Experimente über den Vorgang der einfachen Reaction auf Sinneseindrücke*, wherein he noted two very distinct methods of reaction — the muscular and the sensorial. These are too well known (in words) to require description. Wundt adopted the conclusions of the Langes. The work of the one gave him a criterion whereby to reject all experimental study in psychology which does not proceed on the Wundtian lines; that of the other furnishes reinforcement to his apperception-centre theory. The Langes, in harmony with their teacher's position, consistently refuse to extend their study as *experimental psychologists* into the field of "the unconscious," or the physiological.

It is not my wish to exploit the controversies that have arisen over Wundt's theses,—some of which are bitter. The opposing camps are separated more by innate tendencies or philosophical bias than by differences of fact. Some men by nature cling fast to the tangible. It is easy to say they take short-sighted views, and give but partial accounts of the problems they investigate; they grant the truth of the charge, and try to remove it by discovering more. Their results are but fragments; we need not look to them for complete theories. Two of these it will suffice to mention.

In 1889 appeared Ribot's *Psychologie de l'Attention*, comparable in its general method of treatment, critical, with Müller's *Zur Theorie der sinnlichen Aufmerksamkeit*. Müller's great interest centred on the psychic initiative, Ribot's on the mechanism of attention. Ribot recognizes the subjective aspect of psychic phenomena and asks, what are its bodily conditions? These he finds in the more or less isolated (differentiated) muscular tensions, which in turn call into action limited portions of the nervous system. The ordinary round of life exercises the brain normally, that is to say, all parts function in an habitual way; new conditions disturb this equilibrium and the new tensions arouse new cerebral arrangements, and thus produce the states *known* as spontaneous (natural) or voluntary (artificial) attention.

But it is to Münsterberg we must turn for experimental investigation of the motor basis of attention. Much has been made of the antagonism between the views of Münsterberg and those of Wundt, yet, as has been said, the difference rests more on innate bias and method than on fact. To one attention is a feeling, to the other it includes the activity behind the feeling. After Wundt adopted the conclusions of the two Langes, the whole Leipzig school felt obligated to close one portion of the field to experiment; whereas Münsterberg, believing there is a province of psychological *phenomena*, set himself to trace these phenomena. Münsterberg maintains the distinctively psychological feature of this study, but sees

no reason to halt so long as there are "physiological" facts with psychological meaning. The results of the Langes gave points of attack, and in the following year (1889) appeared Münsterberg's *Beiträge*, I and II. In the first are set two problems. (1) May not the psychic results reached by voluntarily exerted *Vorstellungsbewegungen* be got without the conscious use of will? (2) Is it possible, by studying judgments whose premises are variable, to find the spot in the psychic mechanism that concerns the transition from passive to active *Vorstellungsbewegungen*? (1-pp. 67-68.) "To him who endeavors to so set forth the psychophysical theory that all the phenomena of consciousness can be referred to changes in the physically conditioned contents of consciousness, no greater bar to progress exists than the distinction between the field of non-voluntary association and that of voluntary *Vorstellungsbewegungen*" (p. 64). The sensory form of reaction requires more time, say Lange and Wundt, because it includes the times needed for perception, apperception, volition and innervation; the muscular form is a mere physiological reflex. The former is open to great variation in time, but has a sure outcome; the latter is uniform in time, but liable to error. Can I get results qualitatively sensory, and which (per theory) are attainable only by the sensory form of reaction, by using the muscular form? asked Münsterberg. He did. The judgments given (as results in his experiments) are such as ordinarily require reflection and choice; the times correspond to the motor requirements.[1] Manifestly, "of any sequence of the various acts we cannot speak; yet with this sequence stands or falls the apperception theory" (p. 121). Ordinary consciousness distinguishes voluntary and involuntary mental acts, and is supported by the prevalent psychological school, as represented by Wundt, which sharply separates apperception and association, denies the former is derived from the latter, and affirms that choice and judgment are not influenced by the contents of consciousness, but are basal. The apperception theory is safe so long as it remains within the psychic sphere. But when we think of the brain and the result of physical changes there on the content of consciousness, we see the two are not separate; physical dependence must be related to physical causation (cf. pp. 107-108). Even though the short form be as Wundt says, a mere reflex, yet "I believe it is competent to form a point of departure for the investigation of complicated psychic acts" (p. 110). In cases of pure apperception the time should be shortest, according to Wundt, when attention is on the first member of the series, the signal; Münsterberg found it to be shortest, in the sensory form, when attention was on the last member, the movement (p. 114, 115). If, one may ask, both reaction forms have psychic worth, how account for their differences? Münsterberg's reply is, most of the work is done, in the motor form, before the measured part of the experiment begins (p. 171). When the conditions are known and the order is to react quickly,

[1]The work, in brief, is as follows: With a five-fingered keyboard and five classes or possibilities of answers, the subject makes in the shortest time a finger movement to express a reply to a problem given by the operator. *E. g.*: In the seventh series of experiments, with fingers assigned to groups: Poets, Musicians, Naturalists, Philosophers, Statesmen, a name—*e. g.*, Locke—was to be listed under the heading Philosophers. In this series the average time taken when the sensory reaction was used, was 1122σ; with the muscular form, but 437σ. The second part of the work was given to a comparison of free association with acts of simple judgment. Beginning with random association the experiment was conditioned, both subjectively and objectively, until complicated judgments were called for, yet the reaction-times did not increase in like ratio so long as the short form was used.

the will to act already exists in the idea when perceived. Thus it is the reaction is made before the signal has roused what we call "its meaning" in the mind, before it is apperceived, and before any relation between it and the reaction has found a verbal judgment (p. 166).

Part II of the *Beiträge* contains an article, *Schwankungen der Aufmerksamkeit*, wherein is detailed a re-examination of the work on which N. Lange based his theory of inner initiative for sense attention. Wundt's first care is to preserve the unity of consciousness, Münsterberg's is to preserve psychophysics. If we say consciousness can turn away from one part of its content to another, like the physical eye, then psychophysics is at an end (pp. 70-71 and 123). The outcome of this study is that the contents of consciousness and not consciousness itself, change with the variations of attention, and that these variations are due to peripheral causes (*e. g.*, muscle fatigue) and not to presence or absence of an inner assimilating memory image. "I believe my experiments point to that conclusion which Lange rejected, namely: these variations are conditioned peripherally and not centrally. Understand me; I do not say that attention in general is only a peripheral phenomenon, nor that all variations in the content of our consciousness find their psychophysical cause outside the central organs; I do not say that alterations of our special cases run on unconnected with central reflex paths, but I believe that this particular effect, the coming and going of the perception, is due to changes within the sphere of the contributing sense organs" (p. 94). In *Die Association successiven Vorstellungen* Münsterberg (3) describes a study of the question: Is the reproduction of ideas determined by an inner relationship alone, or must there be an outer link, arising from the simultaneity or sequence of the stimuli? He decides for the latter, and holds that idea *a* dissolves itself in the innervation that makes the tension which calls up *b*. It lies in the nature of the muscular system to associate its movements serially on reflex lines; hence one movement is the stimulus for its successor. The various stages of this series are reflected—in consciousness—as associated ideas. Münsterberg employed the memory-span test, using letters seen singly. His first group was made with free attention; the second group was with attention distracted by mental arithmetical problems performed aloud. In the latter group his ability to reproduce the series was much diminished because the vocal apparatus was so employed as to prevent utterance of the names of the letters seen.

The fight is still on. Each side believes in a psychic force—the motive power; each believes objects can arouse this force. The one takes the mind after it knows what it does and says that all which goes before is inscrutable to psychology (but cf. Wundt, 1-II, p. 279); the other trenches on this preserve, and sees in the connection of feeling and muscle tensions a preliminary stage in the formation of ideas which is fairly safe matter for the psychologist's study. It may be said the efforts of the one are on Kantian lines to push "understanding" back into the territory of sense (cf. Wundt's innervation theory, and passive apperception); of the other, to advance "mere association," brain processes and muscle tensions, into the field of mind. In Vol. VIII, *Philosophische Studien*, are articles by Eckener and Pace, based on re-examinations of the contradictory experiments of N. Lange and Münsterberg, which claim to substantiate Lange's conclusions. The matter reminds us of the claims made for the innervation theory. The latter was plausible, but when, after long dodging it did give tangible

"proof," this became aid to its opponents. The conclusions of those who defend the inner initiative must always rest on inference; their proofs when brought into the field of action become Pyrrhic elephants.

III.

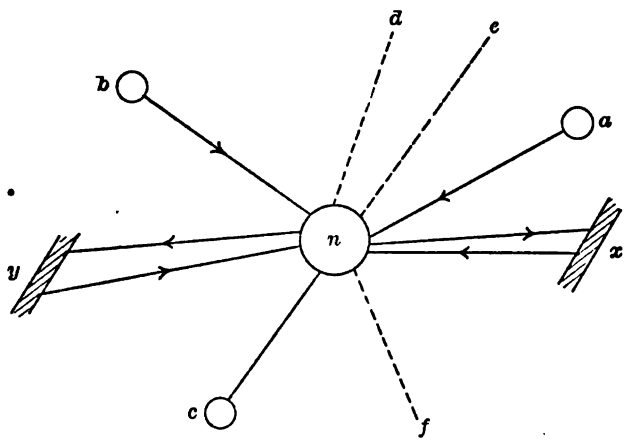
After one has been working in a given field for some time, there grows up in his mind an almost unconscious attitude toward the subject of his study,—the result of his reading and experience. It is hard to describe this position simply, because in its darker parts there lie all the explanation and harmonization one needs; these are felt to be there, even if not evident to a critic. Yet some clue to a writer's bias is helpful; hence the following statement of the thesis maintained in this paper, given with the hope the argument will be examined to learn the meaning put into the words used.

A popular psychological assumption is that mind is awakened by stimuli from without,—the production of sensations. This view may be put thus: *S* O———o *s*, in which *S* represents the central system, *s* a sense organ. A stimulus in *s* passes to *S*, and there is known. From *S* in turn the stimulus-force, or idea-force as it should now be called, passes out to other parts of the organism. Whether it passes on motor nerves only, is in dispute. G. E. Müller, resting on Helmholtz's experiments, claims an idea can and does retrace the sensory path and awaken in the end-organ sensation. Wundt, James, and most psychologists hold that consciousness is an inner force that expends itself at will—on motor lines; Bain makes much of inner spontaneity plus fortuitous combinations of desires and movements, which enable the mind to satisfy its wants. Wundt, James, Müller and others hold to inner association and arrangement of ideas. Opposed to them are Bain, Münsterberg, Ribot, Féré, who hold to muscular successions that condition association. The former teach that consciousness precedes and directs attention; the latter claim it follows the muscle tensions that are "attention." The position most in accord with the common understanding of our subject is that held by the men of the inner initiative. *E. g.*, for Prof. James "selective attention" gives us what we call sensations, *i. e.*, picks out certain vibrations and arranges them in the order in which they come to consciousness; Wundt's apperception theory is akin. This mobile inner force can so deploy its energy as to facilitate sensation by preparing the end-organs for the reception of stimuli, and even, as some claim, by anticipating in the sensory nerves the stimulation; it also helps us to perceive, conceive, discriminate and remember; it gives us time-order and ideas of number; it quickens reactions; it both magnifies and suppresses feelings and ideas; it interferes with our bodily functions. But experience shows us that attention is not always controlled from within, and to meet the need names are given, *e. g.*, reflex and conscious, involuntary and voluntary, and passive and active, whereby it is hoped the attention forms may be classified. Here again disagreement prevails; to the strenuous advocates of an inner force a self-directed activity can be neither reflex nor involuntary. Wundt, in the fourth edition (I, II p. 278), lapses somewhat, gives up the terms voluntary and involuntary, and claims that attention is characterized by passive and active features, and that the former always precedes the latter. This inner-activity view is one that as a whole lends itself to easy comprehension; only when its bases are touched does it disclose gaps. Against it are several theories. Spencer treats the mind from a totally different stand-

point, and so ignores attention; to Ward it is one of the fundamental divisions of mind. Yet another position, and one that in some respects meets with favor because of its tangible reference, is that attention considered on its psychic side is only a state corresponding to a physiological state of activity in the muscles. The advocates of this view—to speak in a general way—are Bain, Münsterberg, Ribot, Féré. No two of these men agree throughout, yet for general purposes the classification may stand.

The remainder of this section will be given to an attempt to formulate a working hypothesis of a view that sees in attention *per se* a muscular basis. The effort will be to apply in another way what has been in the air so long as to be general property; *e. g.*, Hall's insistence on motion as the basal psychic fact, James' emotion theory, Münsterberg's muscle-link for association, and the many minor studies akin to Lehmann's.

The annexed figure may illustrate the process wherein ideas are made manifest.



a b c are sense organs; *n* is the central nervous system; *x* a muscle group whose tension proves favorable to use of *a*; *y*, muscle group that becomes connected with *b*; *d e f*, other muscle groups, some or all of which may, and at times do, tense simultaneously with *x* or *y*, or both.

Assume the discharge into *x* is definite. Then my thesis is: When the stimulus comes via *a*, it must end in *x* before consciousness can be said to exist. The process *a-n-x* is an indecomposable unit which corresponds to the single state of consciousness that knows (or is known as) the given sensation. *a n x* gives the sensation-tone, the qualitative characteristic of the particular experience; but, alone, it is in no general sense of the word to be considered as "known." *a n x* is the condition of a bare sensation (in so far as such an abstraction can be considered); the conditions of knowing *a-n-x* are the related tensions in *y-d-f*. But the discharge from *n* is seldom if ever exclusively into *x*, though it is assumed the greater part is so sent; instead it irradiates and sets up a general readjustment, into which comes a new disturbing factor in the incoming sensation from the tension of *x*. This latter state, *i. e.*, the reception and assimilation of *x*'s tension-sensation, gives us knowledge about the former *a-n-x*

state. a-n-x gives a simple idea; if it can be said to be known at all, it is absolutely relationless; no attention can be given it until its final term has been referred back to n and redistributed. Thus comes the claim that attention, as a psychic fact, follows and depends on the muscle tension, and we do not attend to an idea until after the idea-stimulus has run its course. The links that connect our ideas and bring them into the field of consciousness are these kinæsthetic sensations, and our personal power is shown in rejecting some and holding to others. As our bodies could go nowhere save for bone resistance, so our mind's endeavors would be fruitless without muscle objectification. It may be the stimulus that reaches n is of a kind or degree that has no preferred outlet; in this case the many and inharmonious tensions produce a state of emotion, *e. g.*, fear, with beating heart, panting breath, protruding eyes. Normally, however, one path does get preëminence, and the sensation gets a relatively definite name or expression—in vocal cords, facial muscles, a shudder, or otherwise. Theoretically it was at first a matter of indifference whether a-n ended in x or in y; practically, with bodies constructed as are ours, some lines of discharge are innate. Yet connections may be and are made between, *e. g.*, b and x, a and y. Thus names call up not their own "ideas," but their "meanings."

The correlation of tensions is one aspect of a process of which the other is the unification of ideas. This is shown in the acquirement of an art, *e. g.*, writing, cycling. At first are many unneeded and untimely efforts and much confusion as to one's course; with practice the irrelevant acts are suppressed and their force turned into desired channels. In this correlating process, so long as there is a prospect (or feeling) of success, the subject is interested; when failure is inevitable, interest goes. Herein is a clue to the nature or origin of interest; interest is the inner aspect of the muscle-correlation process. Interest attests a nascent adjustment of actions, and roots in the unconscious because at bottom the muscular harmonization is physiological. Interest, however, is never present in first sensations, because it partakes of and follows the intellectual element. First experiences awaken in us emotions, *i. e.*, states corresponding to first or incomplete tensions and tension-adjustments. Emotion lacks clearness because it has no definite or dominant tension to tie it to the objective, and an emotion is difficult to reproduce because it lacks a special muscle element. Given the motor means of recall, and interest appears as an index of the smoothness (or possibility) of interaction of various ideas and their tension-elements. To this extent interest and attention are running-mates.

To the claim that attention can be present only after the idea that evokes it, the objection may be made that a babe is all attention to every intense sensation. But the babe's ideas get their set by these very tensions, and grow in clearness as the tensions pass from mass to particular; unbroken attention is equivalent to catalepsy. The state exemplified in the babe is what I understand Wundt now to assert in his statement, "passive precedes active attention." Further, the stimulus passes to its reaction, the latter sets up an idea in mind; then—with one idea uppermost—comes will (James) or voluntary attention, *i. e.*, knowledge of what has been done, and prevision of a repetition under like circumstances. Yet this idea that is in mind is but a representative of the act to which interest attaches and for the sake of which we wish to attend. By conforming to it, we put ourselves in condition to get a repetition of the former stimulus and its results. How conform? By tensing one

and another muscle until we are aware of the correct mental state. The assertion: The presence of an idea before an act constitutes ac- active (or voluntary) attention, seems negatived when we consider the running-off of a habit-chain in which each step is preceded by its non-willed cue. In fact no sharp line can be drawn between passive and active,—it is a matter of the degree of tensions involved (cf. Münsterberg, 1, I, p. 67); to the actor the distinction is known by a wider grasp of related acts, which calls into play the higher centres, not necessarily to control, yet in action to accompany the habit-centres. We can attend to but one thing at a time, because to us, in our stage of growth, anything short of a unification of tensions produces a greater or less degree of emotion, wherein the harmonization of tensions and mental state are alike deficient, and one knows not what to think. As a matter of fact we can attend to two or more matters that do not interfere in the modes of expression, though here as in any other concatenated act, now one, now another part of what is really one compound act is clear in mind. Yet this differs in no essential respect from any art.

When any part of the body is the object of attention we know we attend to it by experiencing the tension of its muscles, our attention is assured by the strain. When a sense is used as a medium of attention to a stimulus, the strain becomes of minor consideration—necessary to certify the mind is rightly directed, yet of value only as a basis of comparison with the change induced by the awaited stimulus. The difference between active and passive attention, as these terms are commonly used, is that in the former the body-mind complex is in a condition favorable to the recognition of likeness or difference of in-coming stimuli; in the latter comparison is difficult, for either of two reasons: (a) general state of relaxation, (b) great tension of a part not directly concerned in the reception of the unexpected stimulus,—for in either case diffusion is hampered and meaning tarries. Yet comparison may not be difficult in passive attention if so be the stimuli are intense or much unlike, for under these circumstances either the force is sufficient to overbear resistance, or the unlike stimuli find outlet in free channels. The mind feels its freedom when it passes gradually from one object of regard to another, and does not when it goes by leaps, as though a creature of caprice; so we call the gradual progress "active," and feel an inner power, fore-seeing, hence called "voluntary."

Extreme concentration of attention, considered as an inner activity, defeats its aim in that the tension-process becomes greater than that which normally accompanies the awaited stimulus, and thus a disturbance is set up whose outcome is to fill the mind with an irrelevant strain to the exclusion of the one that belongs with the stimulus. Attention (and here tension is meant) needs mostly to be in other parts than those that mediate the stimulus, for thus all interfering action is checked and the parts concerned are free to adjust when aroused. Nor does this apply only to sensory excitations; the most abstract thinking is deranged when the body is out of its normal order. The condition most favorable to the highest state of general attention is the one called "alert indifference." The subject knows his stimulus will be of a certain kind and within given limits. Thus prepared the alert indifference was found to be at its best just as one's inspiration was near its maximum. At this juncture there is a momentary relaxation, which seems to be general. Efforts to attend soon exhausted the subjects. On the view that the muscle tension is an integral part of one's idea, and that maintenance of an idea in mind and maintenance of tension in certain muscles are two aspects of the same fact, it is easy to explain

this tire of attention. The eye fails to "see" clearly because the wonted channels of expression corresponding to certain stimuli are fatigued, although at the same time the eye itself may be in good condition. Like the would-be jumper who takes a long run to get impetus and is exhausted when he gets to the scratch, so one who overstrains his muscles in expectation finds himself unable to seize, or else to react on, the stimulus when it comes. It may be well to repeat there are two distinct facts to be kept in mind of every act of consciousness: the one is a relatively simple chain of three links—end-organ, centre, muscle, and this constitutes a sensation; the other is a complex of many such links, and forms an idea.

Much has been said by the supporters of the central-origin-of-attention theory of the phenomena of attention got by introspection, but an examination of these statements will, I think, show that the condition immediately preceding any particular phenomenon is a muscle state. In other words, the psychic state is indissolubly bound with and dependent on a tension; attention follows, not precedes, that to which we attend.

Helmholtz, to illustrate the freedom of attention, cites the fact we can hold to a faint stimulus whilst a stronger one to the same sense is debarred (pp. 971-2). Evidently it is assumed that stimuli produce reactions proportionate to their objective intensity. That this conclusion is untrue, in so far as our measure of objective intensities goes, is well known. Were the neuro-muscular system always to return to a neutral state after each response, we could expect the stronger stimulus to draw the attention. Further, there seems to be the assumption that a stimulus to, *e. g.*, the eye, is shaped by that sense into an idea. James (I, 50) exposes this error. Hering (pp. 84-5) shows that clearness (the point involved in Helmholtz's claim) depends on the relation of the given sensation to its sensation environments; in other words, that the clearness of a sensation is measured by the relative strength of the interrelations of the particular tension response to the other tension states of the body at the moment. The "stronger stimulus" fails of entrance because opposed by the tension state favorable to its "weaker" rival. Wundt also accords: "The clearness of a *Vorstellung*, whether sensation or memory-image, is conditioned both by the strength of its perception elements and by the sharpness of their apperception" (1, II, 271). Interpreted in the light of the experiments given in this paper, Wundt's words state the equivalent to (a) proper functioning of the end-organ and its immediate responses, and (b) the adjustment of the latter in the general body-state. Wundt admits that an unexpectedly strong stimulus breaks up the preparatory attention-tensions (and this happens at times to such a degree that the new stimulus apperceives the mass that had awaited it); but, apparently, he does not recognize that the over-tension of the muscles concerned in the apperception of the in-coming stimulus also prevents or warps apperception. So far as clearness is concerned, its conditions may be summed up in: If attention checks irrelevant tensions, *i. e.*, if it is expended in such a way as to leave free the muscles needed to receive the awaited stimulus (or idea), it aids; if it checks these constituents, it hampers clearness.

Fixate carefully a small object (and the greater the attention the smaller is the field of application) and it soon disappears. It goes when the feeling of strain is greatest, says Helmholtz (p. 365) and Müller (p. 92). The cause of the disappearance is not that "the strain-idea has driven the object-idea out of mind" (cf. p. 569 for account of rivalry between strain and stimulus), but that the

tensions have diffused into the muscles that serve to give meaning to the acting stimulus. Wundt again: "Impressions qualitatively different require unlike adaptations for their reception. Further, we note that the amount of the feeling of inner expectation keeps pace with the strength of the impression whose apperception we complete. On the exactness of this adaptation depends the sharpness of the apperception. The latter is sharp when the inner attention exactly corresponds to the strength of the impression" (1, II, p. 271). This strength, as we have seen (pp. 548 and 550), is conditioned very largely by the tensions that receive the shock; and we are not obliged to assume any strained condition of a hypothetical inner entity as does Wundt. Our inner expectation really keeps pace with the degree of tensions, and when these lack order their conflict throws the mind into a state of emotion—the inner aspect of the confused muscles. In the experiments herein noted, perception of the time order of (faint) clicks, in § C, was best when there was no feeling of strain whatever; the strain Wundt speaks of is probably only the holding in check of muscles which might inject a disturbing factor into the intended response (cf. with experience of Mr. Luckey, p. 550). If we consider the process of apperception as progressive coördination, we see why consciousness lapses as habit grows,—because attentive consciousness is dependent on shifting tensions; as muscle groups coördinate and function *en bloc*, they escape mutual conflict, and hence give no occasion for opposing states of mind. That reactions do tend to an average status, wherein discrimination or attention lapses, is certain; it is shown by our "constant bias," by Leuba (p. 382-3), who considers it a feature of sense-memory, and again by Daniels (p. 561, n.), who notes the recurrence of certain stock errors. We are debtors to our mistakes if we take them up into consciousness and definitely build them into the way to the correct end, for thus they "lapse," as do all the stages of a series, and so no more offer seductive diversions, but form part of the wall within which our thought runs. Until such assimilation of mistakes is made, the latter are a constant source of error, and may come to be the habitual normal course of reaction. In view of these facts, it seems evident it is these possibles of reaction that determine apperception, and that Wundt's assertion, "Not the intensity and quality of a sensation in itself, but its ability to excite apperception, is the determining factor for the direction of the line of sight," is, as Wundt means it, unfounded. Perception of impressions on peripheral portions of the retina, to use specifically the illustration that for Wundt is general, is either mediated by tensions in part different from those that function with the foveal region, or there is a momentary lapse from the prescribed fixation point. Helmholtz's perception with sides of retina (pp. 934-6) is in point; despite his claim, "attention is quite independent of the position and accommodation of the eyes," there is no need even here to invoke the aid of a hypothetical inner activity. Vision with the sides of the retina enables one now and then, in flashes, to perceive the clear black and white of a disk when it is revolving at a rate sufficient to give a uniform gray. The very point so emphasized by Hering (Hermann's *Handbuch*, III, I, 548) relative to Helmholtz's experiment—that the line of sight must be held with perfect firmness—is the essential condition needed to let the side stimulus work. We cannot speak of eye, but must distinguish eyes and parts of each eye[1]; and to these parts respond different tension-complexes.

The ripening of apperception is a matter much dwelt on by

[1]Cf. C. L. Franklin, *Psychological Review*, II, p. 142, n.

Wundt (1, II, 399 etc.), who claims the mind can divide itself between two or more stimuli, or can perceive them simultaneously. *E. g.*, the stimuli got by the dial-pointer-bell apparatus need not be rivals, but, like two streams, may flow in gradually converging courses until they meet and mingle gently and indissolubly. Nor is the junction for Wundt a result of stimulation, but depends on the ripening of apperception. It matters not if there be no second member; if apperception is expecting such to come, it will act as though the to-be-interpolated stimulus had come, and thus produce "negative errors." Again, though the disparate stimuli have been given, if apperception is unripe, their taking up into consciousness is delayed until apperception is ready to admit them. The obscurity of the process, though great, is not lightened by the explanation of apperception, which "*ausdehnt sich auf die Gesammtanlage des Bewusstseins*" (1, II, 285). It seems fair to infer that by Wundt's view the two series of stimuli in question move in the sub-conscious, and fuse there. But if so, how can active apperception be said to control them? In my own experiments, results like Wundt's were often got, but explicable in a much simpler manner. In the reaction-time experiments, whilst reading, problems were side-tracked into sub- or semi-consciousness, whence their answers appeared in visual terms (cf. p. 565). As Wundt says, "The regular series ran its steady course as though no complication existed, and at a point the simultaneous stimulus joined itself to the former, not as a successive, but as an integral part of a complex idea" (1, II, 399). Yet this does not mean the mind divided itself between the parts, but that separate muscle groups responded to their stimuli, and when in a sufficiently tensed and non-conflicting state, formed the state common to all complicated acts,—and what acts are not in some degree complex? The same process that provides for the preservation of some parts in the complex is sufficient to ensure the forgetting of others.

Daniels' paper, describing work akin to Wundt's complicated reaction-time experiments, and to the study of Angell and Pierce, offers several points for comment. To the subject, while reading aloud, were read series of numbers of three figures each. The subject either ceased reading and at once repeated the number, or continued reading for periods ranging from five to twenty seconds before endeavoring to repeat. It was found the memory after-image does not last fifteen seconds in a reproduceable condition unless its response tension is repeated before its first set is spoiled by succeeding tensions. It is not that the after-image has been in mind,—in that it has a grip in tensions, lies the possibility of its recall. Table III, p. 562 (of Daniels' paper), a general summary, shows the part played in perception and retention by tensions. S., a trained experimenter with self well in hand, made uniform resistance to the impulse to diversion of attention from the reading; but as the stimulus summated its culminating part (the final number of each set) stuck far oftener than either of its predecessors. D., less trained, was unable to resist the onset of the number series, and shows an outgo to the initial number, a return to his reading (*i. e.*, former tension state), and another response to the final number. Here, as before, attention, considered as a conscious state, follows the tension response in every case.

IV.

In the opening paragraph is promised a summary of by-products of the experiments which suggested, and in turn get meaning from, the view of attention just given. The list that follows, considered

from any other standpoint, displays a motley host; but examined for tensions, as characteristics of direction of attention, it presents a homogeneity that warrants recognition. To designate the three sets of experiments, A will be used to indicate the reaction-time, B the association, and C the least interval, group.

In A and in the distraction half of B, the set tasks were more or less hampered by the many and conflicting demands made on the vocal cords. The mere fact that ideas are known in, or by, a nervous system necessitates the presence of some form of expression as an inevitable accompaniment of every stirring of consciousness. By the time any stimulus gets to consciousness, it has found outlet in muscles, and because of our great need for names, a part of this expression is usually in the larynx.[1] Hence use of the voice proved the most distracting device, because of the almost inveterate effort to put our thoughts into verbal form; unless other channels were ready, attention balked. Exceptions that go to illustrate how little depends on conscious direction of attention and how much on diffusion of the stimulus until it finds an accustomed channel, were found. *E. g.*, in A, problems given orally were sidetracked into semi-consciousness, whence they reappeared with visualized answers; in B, thought went on without special names, in a general yet accurate way. Yet in all these cases a general feeling of congruity is our guide, and we do not realize our errors—so frequent—until after they are made; in other words our attention, considered as a mental oversight, follows the tension. Daniels (p. 561, n.) notes an incident common in all similar experiments — the easy formation of habits of response; *e. g.*, any answer once given, whether correct or not, was often repeated. Here it is evident the mind is easily satisfied and directs its attention along the line of habitual tensions. In Daniels' case the vocal cords were in use, and the stimulus given (a group of three numbers) tended to evoke its proper response; as the subject felt himself yielding (*i. e.* as his cords tended to shift one position for another), he resisted not the thought, but the shifting of tensions by putting greater strain on those in use. As forgetting is not doing, so by refusing to name the numbers pronounced, the subject lost the power to recall them; later effort so to do led to discharge in the habit-tracts,—these being uninfluenced by the previous strain. For brevity I have spoken as though all centered in the larynx; while this may not be the case, the point involved is not affected. The fact that in C perception was not hampered by loud reading, save when the latter made one oblivious to sound stimuli, indicates the trouble caused by distraction lies not in the receptive, but in the expressive sphere. Two things cannot be done, nor thought of, at the same time if they need the same or opposing muscles for their execution; if, however, different muscle groups are exercised, many acts can be simultaneous. As so stated this is self-evident, yet many experiments have been made to prove it (cf. Paulhan); further may be noted: in A partial products fused of themselves; in B associations presented themselves (cf. Wundt, 1, II, 398-9); in C the click or shock gave its own order. In none of these cases, as a rule, were the results got by any "direction of attention;" they came in spite of distraction, were mediated by tensions other than those in use for the distraction. If the term "conscious" be restricted to those processes of which we are immediately aware, then the results just noted, of thoughts that appear full-grown, may be said to come from the unconscious. Ac-

[1] In accordance with the laws of simplicity and economy of effort, the flexibility of some parts of the vocal apparatus far exceeds the rate of any other voluntary act.

cept this limitation and our experiments throughout show that fatigue lets the unconscious work, *i. e.*, it lessens distraction, permits a freer distribution of attention. If fresh we had more force available than laboratory experiments required and the inevitable overflow came to light in spurty tensions and frequent responses to irrelevant matters. Too great strain entailed a cramp that prevented some of the most customary associations in B, but these were made so soon as the strain eased (cf. Lalande and Paulhan). In the "unconscious" work noted above, a certain order seemed imperative. Factors in A had to be put in a habitual way; in C the bias, or constant error, defied our efforts at conscious control.

The usual muscular tensions that characterize or accompany concentration of attention, were well marked in all the experiments. Checked breathing, suspension of movements, a strain about eyes or ears, were common. In C the effort to hold an even hand between stimuli to organs of the same sense brought out clearly the great dependence of "balanced attention" on equilateral tensions. To be alert and yet neutral, *i. e.*, to be intentionally indifferent, it was necessary to fixate a point in the median plane and to have an equal distribution of tensions on each side of the body. The slightest deviation therefrom, if but a tendency to a side-movement of the eyes, was sufficient to make uncertain the judgment of the order in which the clicks came. As concentration is tension, it easily passes by overplus into distraction, or opposing tensions. In A uncalled fingers, and even the whole arm, made irrelevant reactions; in B the very effort for great attention defeated its aim; in C the order was easily lost when too much awaited. But attention is not only a matter of tension on its physical side. Without change concentration soon degenerated into stupor; all distractions soon dulled; in each case aid was got, both for concentration and for distraction, by shifting positions. The readjustment of tensions was conducive to distraction if the stimuli were received whilst the change was in progress, because the correct response was but one of many possible tensions; if the stimuli came when the tension-adjustment was just below its crest, they found favorable reception. To get the faint clicks in C, concentration (*i. e.*, suspension of motion) had to be very great; my custom was to draw a full breath and begin to expire just as the clicks were expected. The momentary balancing on the tension-crest enabled the clicks to come as if into the field of vision.

So inveterate (or normal) is the habit of association that it is practically impossible to get trace of an idea without giving it a space setting. Definite localization was all but general; those few cases wherein it failed may probably be explained as unscrutinized. In A the stimuli, coming from the operator, seemed to be external in nature; they and their responses were free from subjective control. In B and C the associations and sensations were projected, and their spatial distance was usually strongly felt. In B at times the consciousness of place was greater than that of the object felt to be there. In C if the focus, fixated in order to keep attention median, was distant, the stimuli were remote; if near by, the stimuli came near. The evident reason for these facts is that an idea rests on a complex, each element of which has its harmonious space-reaction. The nature of a complex idea (an object of thought composed of known elements) necessitates a play of tensions to give its full expression, and full presence as well. Put into terms of an inner activity this kaleidoscopic play may be formulated in: Ranging is necessary for fruitful attention, *i. e.*, in order to get many associates. Mere attention, considered as fixation, lands the mind in

blankness. The fact noted above, that some distraction is an aid to work, finds an inner correlate in the need of "ground-wires" to draw off the excess of energy. The non-attended incidents and possible stimuli about us (for concrete, though extreme, stock-cases, take the button of Scott's class-mate, Schiller's rotten apples, the uproar of the mill) are the background on which we project and estimate our heeded experiences.

Spatial readjustment of our mental stock was often a very conscious and troublesome process. Thus, in A difficult problems were analyzed and solved piece-meal on the lines of least resistance; in B perplexing key-words were dismembered and referred to their root-origins; in C the sensations were commonly translated into objective figures. In B it was necessary to arrange the associations in groups in order to retain them; in C the time order had to be decided by an immediate impulse, else would consideration drive out the possibility of decision. Our experience in C indicates that judgment of time order depends on one's interpretation of his space-experiences. Space to us is largely a matter of projection, and with normal persons this is in terms of sight (cf. Wundt, 1, II, 121-2). So long as the subject in C was fresh and passive, the time order of the stimuli was well perceived; certainty was greatest when there was least conscious effort to decide. Quite otherwise was the matter when for any reason, fatigue or wandering mind and shifting tensions, the order was obscure. In the latter cases decisions, as noted above, wavered between feeling and judgment, *i. e.*, between the impulsive and the conscious. Yet when these opposing claims were examined, I could not see there was anything else to motive them than differences of perceived intensity. My impression is that in the immediate, sensory form the body-state was in a condition of alert indifference; that in the "feeling" form the body-state was one of change, but that the stimulus-tension got and retained a relatively stable condition which, in time, often sufficed to gain it notice. In the last named form one wonders if he started from the stimulus and went to the related ideas, or from these latter over to the idea about the stimulus. But as has been said, when the immediacy of the struggle, the basal feeling of the sensation, was gone, the case was rejected. It should be remembered, however, that these uncertain cases were but a fraction of the series; often subjects gave correctly the order of nearly entire sets (twenty trials each), and were sure of their answers. The doubtful cases bring out the fact that the stimuli were known as unequal; of this, more later.

A constant error, rather a general bias, has been noted in the experiments of the third part. It was easier to decide for one side than for the other, as was shown by the preponderance of correct answers on the favored side, due, probably, not to better perception, but to an excess of answers in one direction. This is akin to habit, perception of the probable, apperception ruts, and, I believe, is related to certain fixed muscle adjustments. For S. and D. this constant error has been shown in Table 4, and in 13 is shown the result of shifting body conditions with intent to redistribute tensions. Although various subjects knew of this failing and endeavored to guard against it, the undertow was too strong to be resisted. At times the bias was maintained, although the intensities of the stimuli were made to differ considerably; now and then the error would change from one side to the other, but in the long run it was fairly constant. Because of this bias, experimentation with some subjects was given up.

Here may be noted the observation that organs of the same sense

receive like stimuli in unlike ways. Differences in the abilities of the eyes and of the ears are well known; analogous is the case of the hands. For a time it was possible to judge the order of shocks in C by these qualitative differences in sensation. There was needed a certain degree of intensity in order to arouse these sensation-forms; below the minimal quantity quality failed to appear. In the case of the very faint clicks this loss of quality was very great. At the outset and for some time thereafter, these were projected on a level with and a trifle back of the shoulders; they were seen, with the eye of imagination, as whitish spots on black backgrounds, like the pictures that represent stars in constellations in astronomical text-books. As intensity increased the clicks became more like experiences known as sound, and so came up toward and into the ears. Yet, unless the subject was in good responsive condition, at the short interval (.024σ), with increased intensity the clicks would overlap, either in a confused sound, or as overlapping auroral flashes, in terms of sight, and before the face. When the clicks were really simultaneous, they were perceived as one located in the occipital part of the brain. In every case as intensity grew, the clicks approached each other; due, probably, to the fact that the tension responses were greater, and so intermixed. Bolton (p. 228) notes, "The strongest sound seemed longer than the rest;" because its effect, more widely diffused, aroused the idea of extension.

It was our custom in C to interchange the battery connections, whereby the stimulus that had gone to one side should be sent an equal number of times to the opposite side; by so doing we sought to neutralize any lurking inequalities. But one day, while using shocks with indifferent attention, we crossed our arms and thus received the right hand shock in the left hand, the shock from the left side in the right hand (cf. p. 550). To our surprise the stimulus in one hand would at times entirely disappear, and when felt was much weaker than its mate. That the objective intensities were unchanged we proved by tests; that the trouble was not a local defect was shown by the fact that at times a plain after-sensation of the shock could be felt in the fingers, though the original sensation had escaped detection. On some days the loss of the shock was especially common in one hand; at other times the opposite hand so sufered; while on yet other days the loss shifted back and forth. Knowing that both shocks were given and of like intensity, one could not avoid watching for a sensation on the perplexing side; but expectant attention in this case was not equal to sensation, although often it was impossible to decide whether a faint trace of the missing sensation had been felt or imagined. These cases seem to be veritable cramps of attention. In one series, designed to get twenty judgments, after nine had been given, I had twenty-one trials on the tenth before making a (guess) judgment. Here shifting one's position did not aid perception. After the eighth trial I walked about to shake off the cramp; after the tenth trial the left cup (by which no sensation had been aroused) was tested and its stimulus found to be working normally. In this case the trouble, though present in a few early cases, did not become set until the series was half done. Another day the cramp began at the outset, and forty trials were made before a judgment could be given; in the final trial the stimuli were plainly felt in both hands, and in their order; in every trial the stimuli had been sent and in changing order. Thirty of the trials were made with right hand above, the remainder with left above. In the thirty-second trial the right-hand shock was missing; in the others of this set the trouble was

with the left side. Not that the left stimulus was always entirely absent. In this particular set my notes show six times when the left *seemed* to lead, although the only stimulus "known" was felt on right; each of the six was a case of left first. When the bias to one side (and especially to the right) was strong, the shocks on the left became dissociated from the fingers, and commonly settled in or near the median plane, at the crossing point of the arms.[1] Two naïve subjects who were used to test this matter, found the median plane tangle; but, introspecting less, and less anxious for exactest judgments, they did not stick on the dead centre, but guessed themselves out of the difficulty. That the trouble was not in the apparatus was certain. The stimuli were given by the break, which gave a stronger shock than the make. In a troublesome run, in which one side repeatedly failed to take part, a slight delay in removing the hands from the cups enabled me to feel the make. So unexpected was this that, despite its real faintness, it startled me far more than had the regular stimulus.

If the non-appearance of the stimulus noted above be due to an attention-cramp, it may be asked to which side attention was given. As a rule it is next to impossible for one designedly so to control his attention as to become oblivious to surrounding stimuli; the very effort to turn away from a stimulus often puts its claim more forcibly. So, too, it was practically impossible for one to fail to perceive an awaited stimulus without becoming disposed to be alert for its coming; yet the positive and strenuous direction of attention actually did less to facilitate perception than did a state of indifference. In general the shocks in the side to which attention was given were felt as being much weaker than those in the unattended side,—doubtless because the strain diffused until it cramped the mobile parts needed to receive the expected shock. This fore-tension explains in part why "not even shock affects the muscular form of reaction," for not only is the shock's work begun, but once begun, the probability of diversion is lessened. In a sense it may be said, "Expectant attention and sensation [are] identical processes." (James, I, p. 429). In the case noted above the tension in the attended hand was as great as, or greater than, that produced by the shock, hence the latter was felt little or not at all. In the other hand the contrast between the relaxed and the contracted conditions gave a good example of passive attention, with a difference of states so great as to compel regard. Hence in this experiment serial order was often upset, because at times the only shock-tension experienced was in the non-attended hand, and this was heeded because the only other mental rival was the consciousness of a cramp. In truth the latter was no rival. Treating the hands as disparate senses, the case was akin to our common experiences wherein we refuse response to so-called distractions. Again it may be said a certain amount of distraction facilitates perception, in that it prevents this overflow of tensions (compare Urbantschitsch and Münsterberg, 4). "Distractions" need to be further differentiated, since they may be more attractive and absorbing than one's set task, and so fill his mind; or they may be suggestive of varied associates and so make concentration all but impossible.

It may be objected that the illustrations given of cramped attention are all exclusively physiological, and the extension of inferences therefrom to ideas questioned. But quite similar were the experiences in B—association. While adding for distraction, it was

[1] Compare "An Experimental Study of Simultaneous Stimulations of the Sense of Touch," W. O. Krohn, *Journal of Nervous and Mental Diseases*, March, 1893.

much easier to have "knowledge-about," i. e., to broadly survey, one's addition, general feeling, flight of time, progress of the experiment, and the like, than it was to attend to the key-words. The effort to hold fast the word bred stupor, gave cramp; the tensions corresponding to the work of addition, one's acts, etc., were in continual change. Whole sections of common thought were often left untouched during the time allotted for association.

In any discussion of Attention we need to consider first the name, for it is a word that includes in its various meanings all mind action—passive and active,—and because of this range its explanatory value is but a pretence. Leaving aside the fact that consciousness is active *per se*, the attention that we know is a resultant of tensions, *i. e.*, an element in knowing and so is present in all states of mind. What the motive power back of this tension is, we do not know; but nothing is gained by giving it a name of ignorance and then subdividing this X into active and passive forms. We feel mind action to be passive when aroused chiefly by sensory means (and these include a large part of the suggestions that motive idle revery); active when aroused by ideo-motor means. In the former we find ourselves in an attentive state because of the impulsive response of sense-organ adjustments; these in cases, *e. g.*, iris and lens, go on out of mind. In the latter the kinæsthetic idea is necessarily in mind before its sequent steps are aroused, and the mind, prevising, feels its initiative. In either case attention as a psychic state follows and depends on tensions.

The study noted in these pages was carried on under the general direction and with the constant aid and counsel of Dr. E. C. Sanford, to whom my thanks are due in large measure; however, he is no way responsible for the short-comings. To President G. Stanley Hall for stimulating suggestions and insights that rouse one to new views, and to Dr. W. H. Burnham for sympathetic criticism and assistance all along the way,—I wish especially to acknowledge my obligation. Nor would I omit to recognize my debt to Mr. Jonas G. Clark, to whose generosity is due the facilities so abundantly furnished for my work. It is a privilege to thus express my indebtedness to these men, for, because of them, the work was made a pleasure.

V.

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PSYCHOLOGY OF RELIGION.

I.—A STUDY OF CONVERSION

BY

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A STUDY OF CONVERSION.[1]

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Throughout Christianity, down to the modern "revival meeting," a phenomenon has been prominent, commonly called "conversion." In the Greek, Roman Catholic, Lutheran, Anglican, Episcopal and some other churches, it has a correspondence in "confirmation." It is characterized by more or less sudden changes of character from evil to goodness, from sinfulness to righteousness, and from indifference to spiritual insight and activity. The term conversion is used in this study in a very general way to stand for the whole series of manifestations just preceding, accompanying and immediately following the apparently sudden changes of character involved. This is an attempt to get at the mental and spiritual processes at work during conversion rather than to establish any doctrines or definitions.

In order to get together a number of typical cases of sudden awakenings, to compare them, to discover what life forces are at work and to see where they belong from the standpoint of modern psychology, the following list of questions was sent out promiscuously:

"This inquiry is undertaken in the belief that religious experience is the deepest, most sacred and important of life, and that collating a large number of facts will help much in understanding the laws of the spiritual life. You are earnestly requested to assist by recording your own personal experience, anonymously if preferred, in the exactest manner. The confidence should be full in replying, and will be most sacredly respected.

"The results of the research will be sent to those making returns, if desired.

"You need not be confined to the outlines. If you cannot answer all questions, notice those only which appeal most strongly to your experience.

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[1] The following article is a continuation and extension of two lectures given before the Harvard Religious Union Nov. 19th, 1894, and March 11th, 1895, respectively.

I am indebted to Dr. G. Stanley Hall for sympathy and helpful suggestions in carrying out the following research, both before coming to Clark University and while here; my wife has given much valuable assistance in the preparation of the article; Prof. Lillie A. Williams of the New Jersey State Normal School has furnished much of the raw material for the study from her classes; Dr. John Bigham of De Pauw University has assisted in the same way. I wish to thank not only these persons and several members of Clark University, but all those who have been self-sacrificing enough to furnish the facts used out of their own experience.

"A. CONVERSION, CONFIRMATION, OR ANY SUDDEN AWAKENING.

"I. What religious customs did you observe in childhood, and with what likes and dislikes? In what ways were you brought to a condition to need an awakening—faulty teachings, bad associations, appetites, passions, etc.? What were the chief temptations of your youth? How were they felt and how did you strive to resist? What errors and struggles have you had with (a) lying and other dishonesty, (b) wrong appetites for foods and drinks (c) vita sexualis; what relation have you noticed between this and moral and religious experiences? (d) laziness, selfishness, jealousy, etc.

"II. What force and motive led you to seek a higher and better life:—fears, regrets, remorse, conviction for sin, example of others, influence of friends and surroundings, changes in beliefs or ideals, deliberate choice, external pressure, wish for approval of others, sense of duty, feeling of love, spontaneous awakening, divine impulse, etc.? Which of those or other causes were most marked and which were present at all?

"III. Circumstances and experiences preceding conversion:—any sense of depression, smothering, fainting, loss of sleep and appetite, pensiveness, occupation disturbed, feeling of helplessness, prayer, calling for aid, estrangement from God, etc.? How long did it continue? Was there a tendency to resist conviction? How was it shown?

"IV. How did relief come? Was it attended by unnatural sights, sounds, or feelings? In what did the change consist:—breaking pride, public confession, seeking the approval of others, feeling God's forgiveness, sudden awakening to some great truth, etc. How sudden was the awakening?

"Did the change come through or in spite of your own thought, deliberation and choice? What part of it was supernatural or miraculous?

"V. Feelings and experiences after the crisis:—sense of bodily lightness, weeping, laughing, joy, sorrow, disappointment, signs of divine pleasure or displeasure, etc. How differently did you feel towards persons, nature, ideas, God, etc.? Did you have unfulfilled expectations or disappointments?

"VI. Comparison of life before and after:—changes in health, habits, motives, conduct and in your general intellectual and emotional attitude. Did you undertake any private religious acts, as Bible reading, meditation, acts of self sacrifice, prayer, etc.?

"VII. Were there any relapses from first experience? Were they permanent or temporary? Any persistent doubts? What difficulties from habits, pride, ridicule or opposition of others, etc., had you, and what methods did you adopt? Do you still have struggles in your nature? Does that indicate that the change was not complete? How have you and how will you overcome them? What needed helps, if any, were wanting at any time?

"VIII. Did you always find it easy to follow the new life and to fit into its customs and requirements? If not, how did you succeed—by habit, pressure and encouragement of friends, a new determination, a sudden fresh awakening, etc.?

"IX. State a few bottom truths embodying your own deepest feelings? What would you now be and do if you realized all your own ideals of the higher life?

"X. What texts, hymns, music, sermons, deaths, places and objects were connected with your deepest impressions? If your

awakening came in a revival meeting, give the circumstances and methods used. What do you think of revivals?

"XI. If you have passed through a series of beliefs and attitudes, mark out the stages of growth and what you feel now to be the trend of your life.

"B. GRADUAL GROWTH.

"If your moral and religious life has been a more or less steady growth, kindly describe it, including the following points and any others of importance which occur to you, in addition to I, II, IX and XI above:

"I. Influences, good and bad, which have been especially strong in shaping your life: — parental training, work, friends, church, music, art, natural phenomena, deaths, personal struggles, misfortunes, etc.

"II. Were there periods at which growth seemed more rapid; times of especially deepened experience; any sudden awakening to larger truth, new energy, hope and love? At what age were they? How did they come:—some crisis, a death, meditation, some unaccountable way, etc.?

"III. Have you had a period of doubt or of reaction against traditional customs and popular beliefs? When and how did it begin and end, if at all? Have you noticed any relapses or especially heightened experiences? How did they come and with what were they connected?

"IV. Have you felt or known any special revelation of thought or feeling to come to you, and in what way? Has your growth come through, or in spite of, your own thought, deliberation and choice.

"C. SUPPLEMENTARY FACTS.

"(*a*) Describe any faults or acts you have committed in which you knew at the time they were wrong. Why did you do them?

"(*b*) What sudden awakening of power have you noticed in yourself, in others or in animals:—speaking, singing, playing, loving, hating, reasoning, etc.? How sudden was it? How do you explain it?

"(*c*) Describe any sudden changes which have come into your character or in your attitude toward things or persons. How and why did it occur?

"(*d*) Have you ever had a time of great uncertainty which of possible courses to pursue,—in choosing a calling, in love, whether to do an act or not, etc.? Describe accurately and minutely your feelings preceding, during and after the struggle.

"(*e*) If you have ever broken a habit, describe all the accompanying experiences and feelings.

"Always give age, sex, temperament and nationality."

The present article concerns itself only with groups A and C. It has been difficult to separate the cases into the two groups of sudden awakenings and gradual growth. Unless there has been a rather marked change, they have been put in the latter class, except in those cases of revival experience in which the real religious life was thought to begin there, although the contrast in habits and feelings was not great. After separating them the number of sudden awakenings sufficiently complete to use at all in tabulation was 137. Of these, 51 were from males, 86 from females. The difference between them makes it necessary to treat them separately for the

most part. By far the majority were records of conversions occurring under 27 years for males and under 23 for females. For this reason the scattered ones from that age up to 70 years are omitted in all places where per cents and averages are used, and always, unless otherwise stated. The following is thus very largely a discussion of adolescent conversion. (Adolescence extends to about 25.) Of the whole number, by far the majority are Americans, and pretty evenly distributed among the states. Besides there are 6 English, 3 Canadians, 2 Japanese, 2 negroes and 1 German. In most instances the church connection was not given. Almost all, however, are Protestants, and nearly all the denominations appear to be represented. At least 4 are Episcopalian. Nearly half were conversions occurring at revival meetings. The rest were in regular church service, at confirmation, and at home. The per cents showing the circumstances under which the conversions occurred are given in:

TABLE I.

CIRCUMSTANCES UNDER WHICH CONVERSION OCCURRED.	Male. %	Female. %	Both Male and Female. %
At revival or camp meeting,	48	46	47
At home after attending revival,	5	6	5
At all under revival influence,	53	52	53
At home and generally alone,	32	16	21
At regular church, or prayer meeting, or confirmation,	4	25	18
Circumstances not given,	11	7	9

Among other things, it should be noticed from Table I that revival meetings play an important part in conversion, either by directly inducing a change in the life, or in leaving impressions which are worked out immediately afterwards; but that conversion is a phenomenon which so far belongs to growth that about one-fifth of the entire number (21%) have taken place independently of immediate external influence. When it is remembered that revivals are generally carried on with much emotional pressure in the way of exhortation, songs, music, prayers and personal influence, it is significant that the per cent. of revival conversions is about the same for males and females; that of the remaining number more of the male than of the female conversions (32% vs. 15%) work themselves out at home; and that one-fourth of the female conversions, as against only 4% of males, occur under the more quiet influences of the usual church services.

THE AGE.

The four curves below, in Figures I and III, show graphically the frequency of conversions for different years. Spaces to the right show the ages from 7 to 27 years. Distance upward stands for per

cent. of the whole number for each year. For example, in the case of males 20% of the conversions were at 15 years.

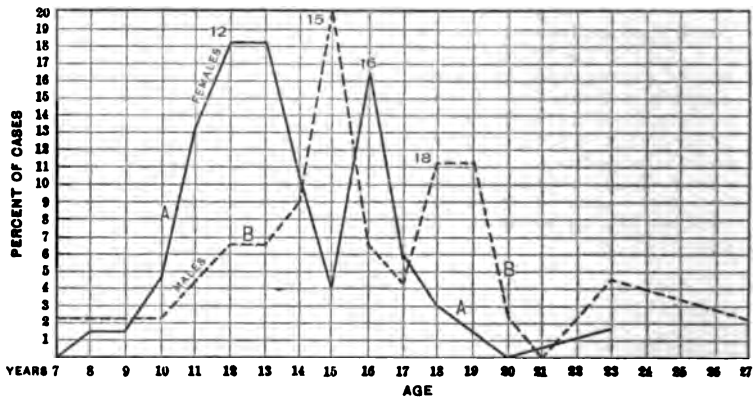

FIGURE I. *Showing the periods of greatest frequency of conversions.*

Since the females were nearly all above 18 and the males above 20 years at the time of making the record, the probability is the same that any conversion would fall within any year previous to that. The curves would then be straight lines parallel to the base. The value of the curves is in their irregularity. Curve A for females shows that below 10 years of age there are very few conversions. The number increases from 10 years, to 12 and 13, which is the period of greatest frequency. From that time they become less frequent until 15 years. At 16 the curve rises almost to the height of the first rise. Beyond 17 there is a gradual decline. Similarly, curve B for males begins at 7, rises gradually to 14, culminates at 15, declines to 17, has a second elevation at 18 and 19, and gradually falls after 19.

The character of the curves is so striking that some of their more significant features will be considered:

(*a*) *The years of greatest frequency of conversions correspond with periods of greatest bodily growth for both males and females.*

Curve B, for males, begins earlier, rises more gradually and culminates 2½ years later than A. These points have an analogy in physical development. Roberts[1] shows that in the degree of physical maturity of men and women, 12½ years in females corresponds to 16 in males.

The analogy between the greatest height of A and B and the period of most *rapid* growth is also of interest. The curves in Figure II are adapted from Donaldson,[2] and are from Stephenson's[3] averages of the measurements of Bowditch[4] and Roberts.[5]

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[1] Chas. Roberts, "Physical Maturity of Women." *Lancet*, London, July 25, 1885. Roberts' report is based on the researches of Bowditch, Chadwick and himself.
[2] H. H. Donaldson, "The Growth of the Brain." New York, 1895.
[3] Stephenson, *Lancet*, 1888.
[4] Bowditch, "The Growth of Children." Report of the State Board of Health of Massachusetts. Boston, 1877.
[5] Roberts, "*Manual of Anthropometry*," 1878.

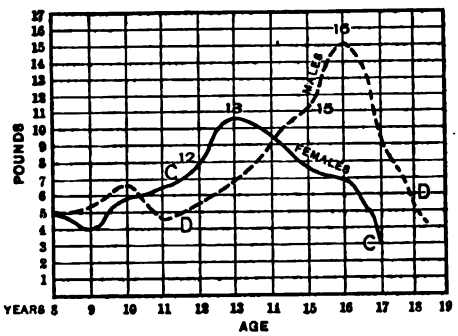

FIGURE II. *Showing annual increase in weight of boys and girls.*

They show that females increase in weight 10½ pounds between 12 and 13, and that males increase 15 pounds between 15 and 16, which is 2½ and 3½ pounds, respectively, more than the gain between any other years. In the case of females this exactly agrees with curve A. For the males the increase in weight comes a little later than in the conversion curve; but the difference is not so great, if it is noticed that the greatest increment in D is close to the 15th year.

(*b*) *There is a correspondence between the periods of most frequent conversions and puberty in both sexes.* The time of accession to puberty varies slightly. The phenomena by which its advent is judged are also variant. Table II is based on the age at which the menses appear. Using other physical signs to indicate its advent, would doubtless make the average age somewhat less. "In infantile cases (of *true menstruation*) the attention of the mother is

TABLE II.

Comparing the age of accession to puberty with the time of conversion.
(Females.)

FEMALES.	Age of greatest frequency.	Average age.
Accession to puberty—		
Italians[1] (wealthy), }	13	14.5
Italians[1] (artisan), } 2,760 cases,	13	14.8
Italians[1] (rustic), }	15	15.5
English[1], 500 cases,	?	14.7
American[1], 575 cases,	14	14.8
American[2], 125 cases,	?	13.7
Grouping the foregoing; total,	13.7	14.7
Age of conversion—		
Those at revivals, 46 cases,		13.1
Those not at revivals, 40 cases,		14.6
All together, 86 cases,	12.5	13.8

[1] Chas. Roberts, "Physical Maturity of Women."
[2] Helen P. Kennedy, M. D., *Pedagogical Seminary*, June, 1896.

generally attracted by the womanly development of the child before there is any appearance of the menses."[1] The normal age of puberty is, in fact, generally given in medical records at from 12 to 14 in case of females, and about 2 years later in males.[2] Taking the general group of physical signs[3] as the indication of dawning adolescence, making it 12 or 13 for females and 14 or 15 for males, the agreement with the culmination of curves A and B is of interest.

There is, of course, room for indefinite mental gymnastics in using such statistics. In a general way their points of agreement are interesting. The average age of female conversion, 13.8, differs only by a small fraction from the age of most frequent accessions to puberty, as shown from nearly 4,000 cases. The average age of revival conversions is 1½ years earlier than of those which occurred at home and under the quieter church influences. The average age of conversions not at revivals, 14.6, differs by one-tenth of a year from the average age of puberty. If one should regard these as the normal conversions which take place in the absence of emotional pressure, the coincidence is important. The points of disagreement in the statistics are evident and will be noticed later.

The observations on boys have been too few to obtain tabular results as to the age of puberty. It is generally agreed to be from 2 to 2½ years later than that of girls. It will be noticed that curve B follows curve A by 2½ years and repeats most of its details. The average age of male conversions is 15.7 years, as against 13.8 for females. If the female conversions come near puberty, this difference of about 2 years throws the average age for males at about the corresponding period. It thus appears that there may be a normal age for conversion at about the beginning of adolescence. It is suggestive to notice in this connection that nearly all people, including the savage races, have ceremonies upon the advent of puberty, such as torture, circumcision, knocking out teeth, tattooing, changing the name, nearly all of which are religious rites and intended to initiate the child into a new life.[4]

If the correspondence appears so close between puberty and the average age of conversion, then what of the very early conversions and also those which come much later?

(c) *Early conversion.* It is possible that in the case of the conversion of children, it may be accompanied by, or be the accompaniment of, the awakening on the physical side. The facts have not yet been gathered sufficiently to establish a law of growth in regard to the time of the awakening powers of the youth in general. They are quite satisfactory concerning the age distribution of the time of accession to puberty. The instances are numerous of the precocious development of the reproductive system, and the range extends all the way from 1 or 2 years upward.[5] The distribution, according to years, of the 575 American cases of females from Roberts' report used in Table II are representative. Taking them on a basis of 100 cases, they extend from 10 to 20 years, inclusive, according to the following series: 1, 5, 9, 18, 25, 20, 14, 3, 3, 1, 1. This is approximately the range of female conversions. Other sug-

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[1] R. P. Harris, *Am. Journal of Obstetrics*, 1870-71.

[2] S. S. Herrick, "Reference Hand-book of Medical Sciences," VI, p. 70.

[3] For a description of the bodily changes at adolescence, see G. Stanley Hall, "Training of Children and Adolescents," *Ped. Sem.*, June, '91. Dr. Burnham, "The Study of Adolescence," *Ped. Sem.*, June, '91.

[4] Daniels.

[5] For an introduction to the extended literature of the subject, see Index Catalogue of the Library of the Surgeon General's Office, United States Army, Washington, 1890, XI, p. 761.

gestive comparisons appear: 63% of the males converted before 14 mention sexual temptations among those of childhood, and generally as the most prominent; the rise of curve A just preceding puberty is more sudden than that of B, which agrees with Harris' statement that "infantile puberty is more common in the female than in the male sex;" the more gradual rise of B throughout than of A, is also true of D as compared with C; male conversions begin at a correspondingly earlier age than do the female, and a study of precocious puberty seems to show the same thing.[1]

Other causes for early conversion may be seen from these extracts:

F., 11.[2] "Had deeply religious parents; was always in some sense a Christian; a sermon by my father in childhood thoroughly frightened me, and its effects never left me; was tormented with fears of being lost."

F., 11. "Deep impression was made by a story of a woman who died saying, 'A million dollars for a moment of time;' I was overcome by fear of sudden death."

F., 11. "My early life was careless and happy as a bird's; first time religion seemed meant for me was at a revival, when Mr. M. preached on the crucifixion; he drew a vivid picture of it, and told the congregation they had nailed Him to the cross; my childish heart was broken; felt I could do nothing to atone for making Christ suffer."

F., 10. "Was a naughty child, and was left early without a mother and without education; at a revival meeting several women urged me to go forward; they told me mother could see all I was doing and wanted me to go."

M., 7. "Heard one person tell another of a third person 'confessing her sins;' resolved I would do the same.'"

M., 11. "Was mostly the influence of my seatmate; when he went to the altar I thought, 'Why, if he can be a Christian, I can, too.'"

M., 8. "Sickly as child, prematurely developed intellectually, and called the 'boy preacher' when 8."

F., 11. "When 8, the death of my brother made a deep impression on me; it awakened thoughts of the future; at 9 years of age I attended a revival, and wanted to become a Christian; did try to be better."

M., 11. "Had a sudden sexual awakening at 7 years; it came over me all of a sudden that there was more to life than I had expected."

These instances are typical. Prominent among the forces at work to bring about the conversion of children are overtraining, emotional excitement, mere imitation and precocity. Looking through all the cases before 12 and 14 for females and males, respectively, and estimating the number of them in which any or all of these four causes are present, we have Table III. The per cents show the frequency rather than the importance of each of the causes. For example, in one-half of the cases of females converted before 12, imitation was present.

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[1] I feel like throwing out the caution here that although these sets of phenomena are closely related in time, they probably have very little causal connection. The development of the reproductive system is perhaps, biologically, at the basis of this growth crisis in early adolescence, but is only one of the phenomena in the general awakening.

[2] *F.* indicates females, *M.*, males. The number following always stands for the age at conversion.

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TABLE III.

Showing the frequency of certain causes leading to early conversion.

CAUSES HASTENING EARLY CONVERSION.	Females. %	Males. %
Intense religious training in childhood present in	71	64
Strong emotional pressure present in	86	73
Imitation present in	50	64
Precocity, or hastened seriousness through deaths, etc., present in	43	36
Any one of the above forces present in	100	100
Permanent results,	57	40
Temporary results ("backsliding"),	53	60

That is, in every instance of early conversion, at least one of these causes was acting. The table is only intended as suggestive. The separation by years may lead to false impressions. Many conversions at 11 appear more mature and healthy than others coming much later.

(*d*) *The second rise in the curves.* Both curves rapidly decline after the first culmination, and have a second rise at 16 and 18 respectively. So close is the correspondence that the time between the climaxes of each is the same (3½ years), the depressions are about equal, and the relative heights of the first and second rise of each curve are similar. This came as a surprise, and I am able to find nothing like it in physical growth. The cases themselves seem to throw some light into it. A few of them mention an impulse to conversion at about the beginning of adolescence; it then dropped out of their thought and was revived again later. The following are typical:

F., 16. "When 12 I had an impulse to go to the altar with two girl friends, but something kept me back; (when 16) in a little meeting I felt serious; my friend near me wanted me to go to the altar, and I thought on it and went."

F., 16. "When 12 or 13, at the advice of an old woman, I asked God to take my heart; did feel very happy (was confirmed at 16); never have felt so sincere and earnest, and anxious to be good."

F., 17. "Had made start at 15 in revival meeting, but [illegible] church, and let it all pass over; (when 17) I felt the [illegible] of God; after an hour of pleading and prayer, [illegible] my sins."

F., 16. "I began to feel conviction at 11 [illegible]

F., 16. "I experienced a sort of half [illegible] fore."

From these quotations it would [illegible] for conversion at about the begi[illegible]

not complete or is resisted, a relapse follows. Then there is another time of aroused activity from two to four years later. This appears to be a normal ebb and flow of religious interest. Curve B shows signs of a third fluctuation at 23 years, but the data are too few at that period to allow any inference.

Another cause of the second increments at 16 and 18½ years seems to be that, through some accident, or some defect in early training, the person is not sufficiently developed to respond to spiritual influences at the first normal period.

F., 16. "When 10 years old mother died; I lost interest in everything; I felt dazed and lived in a sort of dream until 16, when I attended revival; had intense remorse; with tears came relief and joy; my whole life was changed from that hour."

F., 17. ("I was carefully trained and taught to pray); when 14 I had companions who laughed at religion; I became like them; often had stings of conscience; (when 17) attended meeting; felt that God had forgiven my sins."

F., 18. "As child of 9 was petted and spoiled; was much with people who cared little for religion; when 18, the downfall and death of a friend I had trusted set me to thinking; cried to God for mercy and forgiveness."

F., 16. "Parents were agnostic; no Christian influence, but the contrary; felt need of religion."

M., 16. "Was a wild, wicked boy; father took pride in my wildness; had been to an uproarious wedding; when I got home I felt condemned; awful impression that death had come; unspeakable joy sprang up."

M., 18. "Was not raised in a religious family; was the first of my family, except mother, to become a Christian."

Almost all the cases occurring at the later periods fall under those two headings. There are various other causes, as suggested in the following:

F., 17. "Had made many resolutions to be a Christian, but pride kept me from telling it."

F., 18. "Had suffered for years wanting to be a Christian and not knowing how."

M., 19. "From earliest boyhood had longed to be a Christian; lived a careful, good life, in hope of being accepted of God because I refrained from evil."

F., 16. "From 10 to 16 I only cared to have a good time, and let myself drift along."

M., 18. "I called myself morally upright, never believing what I said exactly."

It is possib[illegible] that there is a normal period of intellectual aw[illegible]ows the physical and emotional disturbances [illegible]dolescence. The later cases seem to be

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ure III; the average of all the ages is 14.4 years. Using that as the height of another curve which disregards the minor irregularities in E, we have curve F, which is very roughly the curve of frequency of adolescent conversions. If the cases which constitute this study are representative, it appears that early adolescence is the golden period at which there may be a definite, radical readjustment of one's religious nature.

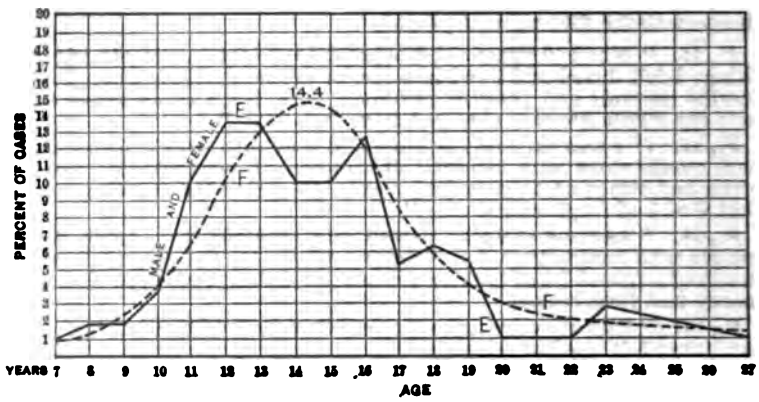


FIGURE III. *Showing the frequency of adolescent conversions for males and females taken together.*

The character of F might be changed with a greater number of cases. Many returns were made by persons 18 or 19 years of age. The chances are thus slightly decreased that conversions would fall between 17 and 27 years, which doubtless places the height of the curve too early. The fact that more returns were from the female sex, which naturally develops earlier, would also tend to make the general average of 14.4 too early. Many more returns are needed to make generalizations entirely reliable.

THE MOTIVES AND FORCES LEADING TO CONVERSIONS.

A study of the motives and forces which occasion religious awakening is not of much importance, perhaps, as furnishing insight into the nature of the developed product, but it is of value from both the scientific and pedagogical standpoints. When brought together, the motives and forces seemed to fall pretty naturally into eight groups: fears, other self-regarding motives, altruistic motives, following out a moral ideal, remorse and conviction for sin, response to teaching, example and imitation, and urging and other forms of social pressure. The illustrations given below are a few of the representative (not the striking) instances:

1. Fears: *F.*, 12. "Terrors of hell dwelt on at revival until I became so scared I cried." *F.*, 14. "Had I died, had no hope, only eternal loss." *M.*, 15. "Fear of God's punishment." *M.*, 22. "Fear of death and waking up in ——." In many instances fears were declared to be entirely absent. *M.*, 18. "Two ministers told me I'd go to hell if I didn't make a stand; I said I'd never be a Christian to dodge hell."

2. Other self-regarding motives: *F.*, 17. "Wanted the approval

of others." *F.*, 11. "Father had died, and I thought I would get to meet him." *M.*, 7. "Ambition of a refined sort." *M.*, 18. "The man who is best is strongest and happiest."

3. Altruistic motives: *F.*, 19. "Wish to please minister counteracted my negative attitude." *M.*, 18. "Wanted to exert right influence over pupils at school." *F.*, 16. "Felt I must be better and do more good in the world." *F.*, —. "It was love for God who had done so much for me."

4. Following out a moral ideal: *M.*, 14. "Feeling of duty." *M.*, 16. "Wanted to be good and control anger and passions." *F.*, 17. "An inner conviction that it was a good thing to do." *M.*, 15. "Had a yearning for higher ideal of life." *F.*, 13. "Spontaneous awakening to a divine impulse." Groups 3 and 4 run into each other. The sense of duty which was not referred objectively is included in the latter.

5. Remorse and conviction for sin: *F.*, 17. "Remorse for past conduct was chief motive." *M.*, 18. "Was thoroughly convicted of sin." *F.*, 14. "My sins were very plain to me; thought myself the greatest sinner in the world." *F.*, 18. "The downfall and death of a friend I had trusted set me to thinking; I wondered if I were not worse than she."

6. Response to teaching: *F.*, 11. "Mother talked to me and made the way of salvation plain." *F.*, —. "A sermon that seemed just meant for me set me to thinking." *M.*, 23. "The teaching of Christ appealed strongly to my reason and judgment." Evangelical sermons described as emotional are included in the last group below.

7. Example and imitation: *M.*, 15. "It began largely as imitation." *F.*, 16. "I saw so many becoming good that I just had to become a Christian." *F.*, 13. "For the first time I came in contact with a Christian family; their influence induced me to become a Christian." *M.*, 16. "I thought only the power of religion could make me live such a life as brother's." This group ranges from mere imitation to sympathy with a great personality, where it closely approaches group 4.

8. Urging and social pressure: *M.*, 15. "The girls coaxed me at school; estimable ladies and deacons gathered round me and urged me to flee from the wrath to come." *F.*, 13. "I took the course pointed out at the time." *F.*, 14. "A pleading word from my teacher helped me." Imitation and social pressure are frequently so intense that the individuality of the subject is entirely lost. *M.*, —. "It seems to me now hypnotic." *F.*, 16. "The sermon moved me; they sang; before I realized what had happened I was kneeling at the altar rail; I never knew what was said to me." In such cases there is one of two results: the forced position is accepted as the right one, or the person rebels when partial independence is gained. The former are included in this study. The cases in which the person appeared entirely to lose his or her individuality, and immediately to react against a forced conformity, are rejected. M., 50. "It was the buoyancy of the atmosphere that made me go forward; I had nothing to do with it; I could have done the same thing every week without any change in my character."

Table IV shows the relative prominence of the eight classes of motives and forces illustrated above as determined by the frequency with which each was named by the subjects. The evaluation was made in three ways: (1) Taking only the motives mentioned as most prominent ones; (2) trying to form an estimate

of the value of all the motives wherever mentioned, by duplicating those apparently very prominent; (3) simply counting their frequency. The first method made the self-regarding motives about one-third more prominent than the other two ways, and subtracted from the moral ideal class. The last two methods gave nearly the same results. Table IV is the result of the third method. It is arranged to show the difference between male and female conversion, and also to compare those taking place at revivals with the others.

(1) *The relative prominence of the different motives and forces:* This is best seen from column 17. Self-regarding motives make up one-fifth of all the causes and one-third of all the subjective forces. The sum of the altruistic motives, 6%, and the response to a moral ideal, 16%, forms a group which may be called distinctively moral motives. The sum is 22%, or about the same as the total self-regarding group. Conviction for sin plays about the same part. Fears are a large factor, and when estimated according to the various ways they present themselves to each person, instead of counting them once for each, they are nearly doubled. Hope of heaven is nearly absent. Fear appears to be present about fifteen times as often as hope. Only 6% are altruistic motives. Of these only 2% mention love of God or Christ as leading them to a higher life. This is significant in view of the fact that love of God is central in Christian theology. The subjective forces are one and a half times more frequent than external forces. Of the objective forces social pressure is greatest. Account was taken of it only when it was actually mentioned. Had the fact of about half the conversions occurring at revivals been taken as evidence that social pressure was really exerted, this per cent. would have been much greater. The same would be true also of example and imitation, which now make up 15% of the forces. Arranging the forces into three groups, according to their frequency, we have, beginning with the highest per cent.: (*a*) Response to a moral ideal, conviction for sin, and social pressure; (*b*) fear, and imitation; (*c*) following out teaching, and altruistic motives. It is of interest to compare fear of hell and conviction for sin, which are prominent, with hope of heaven and love of Christ and God, which are almost absent. These four are all central in Christian theology, and might be supposed to be about equal as religious incentives. It appears that those which are racial and instinctive are very much more prominent than the others. The average age at which the conversions occur in which these forces are present, tends to show the same thing. As a rule those which are racial and instinctive come earliest. The series of the forces which occasion conversion, arranged from the earliest to the latest, are the following: imitation, social pressure, conviction for sin, fear of death and hell, response to teaching, following out a moral ideal and altruistic.

(2) *Comparison of male and female cases:* Three groups of motives appeal about equally to males and females; they are: fear of death and hell, conviction for sin and the altruistic. Two groups appeal to the males more strongly: the self-regarding and moral ideal motives; three to the females more than to the males: response to teaching, imitation and social pressure. The greatest diversity is in the response to a moral ideal, which is 7% greater for males, and social pressure, which is 6% greater in the case of females.

(3) *The revival cases compared with the others:* Fear of death and hell, self-regard, altruistic and moral motives are about the same in both. Imitation and social pressure are greater in revival cases. Response to teaching and conviction for sin are greater in those

TABLE IV.

Showing the frequency of certain motives and forces which occasion conversion, and the average age for each motive.

MOTIVES AND FORCES PRESENT AT CONVERSION.	A. MALES.						B. FEMALES.						C. MALE AND FEMALE.					
	Revival.		Non-Rev.		Total.		Revival.		Non-Rev.		Total.		Revival.		Non-Rev.		Total.	
	%	Av. Age.	%	Av. Age.	%	Av. Age.	%	Av. Age.	%	Av. Age.	%	Av. Age.	%	Av. Age.	%	Av. Age	%	Av. Age.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Fear of death and hell, etc.	16	15.5	13	17.4	15	16.1	14	13.7	17	13.5	15	13.6	15	14.6	16	14.6	15	14.6
To gain heaven	3	14.4	3	16.5	3	15.4	1	13.1	1	13.3	1	13.2	2	13.6	1	15.1	1	14.4
Other self-regarding motives	4		5		4		4		3		3		4		4		4	
Total *self-regarding* motives	23		21		22		19		21		19		21		21		20	
Love of God or Christ	1		3		2		3		2		2		2		2		2	
Various other altruistic motives	2		5		4		4		3		4		3		4		4	
Total *other regarding* motives	3	17.6	8	17	6	16.4	7	14.2	5	16.2	6	15.2	5	15.7	6	16.5	6	15.8
Response to a moral ideal	18	14.8	24	16.9	20	15.8	13	14	13	15.6	13	14.6	15	14.5	16	16.3	16	15.2
Total *ideal & other regard'g* motives	21		32		26		20		18		19		20		22		22	
Remorse, *conviction for sin*, etc.	19	14.8	19	16.3	19	15.3	16	13.5	20	14.2	18	13.8	17	14.1	20	15	18	14.5
Total SUBJECTIVE forces	63		72		67		55		59		56		58		63		60	
Response to teaching	5	17	8	17.2	6	17.1	7	13	10	14.9	8	14.1	6	14.6	9	15.5	7	15.1
Example, imitation, etc.	15	14.1	9	15	13	14.4	16	13.5	15	14.5	16	13.8	16	13.8	14	14.6	15	14.1
Social pressure,—urging, etc.	17	14	11	17.5	14	14.9	22	13	16	14.4	20	13.5	20	13.4	14	15.3	18	14.2
Total OBJECTIVE forces	37		28		33		45		41		44		42		37		40	

which occur in more quiet surroundings. Although social pressure is greater in the revival cases, the sense of sin and fears are even less frequent than in the non-revival cases. This is evidence that the charge we so often make against revivals, that they stir up unduly lower religious incentives, such as fear, is not altogether just. They do not so much *awaken* these highly emotional states as appeal to those instincts already at work in the consciousness, and which would probably show themselves spontaneously a year or two later. The average ages at which the different motives arise show that the effect of revivals is to hasten the working of specific motives. The same motives culminate earlier as a decisive factor in conversion in nearly all the revival cases, sometimes by as much as two years.

There seems to be a normal age when the various motives should assert themselves. This is best seen from Figure IV, in which the various subjective influences at work at the time of conversion are

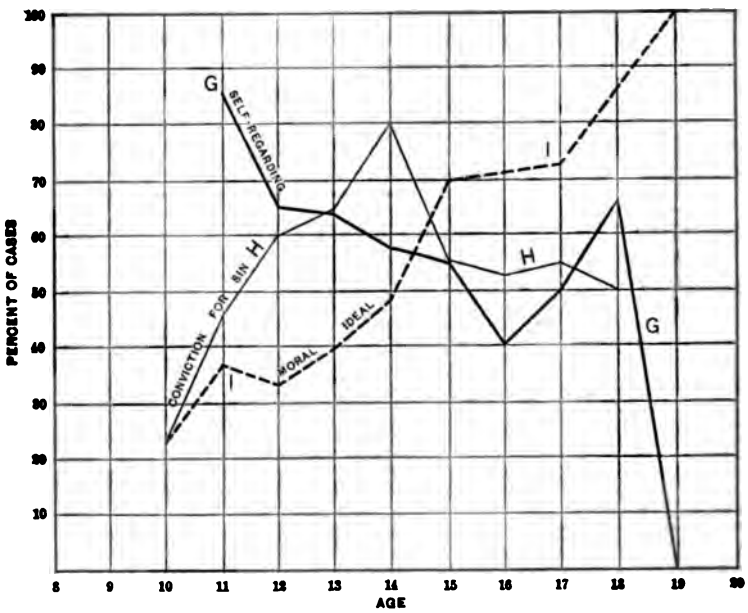


FIGURE IV. *Showing the frequency of various motives for different years (females).*

plotted to show their frequency for different years. Curves G, H and I are made on the basis of the ratio in hundredths between the number of times each motive was said to be present and the number of conversions for each year. Before 10 and after 19 the cases are scattering and the curves too irregular to be of value.

In earlier years the self-regarding motives, of which a large part are fears, are by far in the predominance. They gradually decrease. Curve I, for altruistic and moral ideal motives, exactly contradicts G. It represents the dawn of the moral consciousness. After 15, moral and other regarding incentives are present in almost

every case. The sense of sin, curve H, increases up to the early years of adolescence, then gradually decreases. It may be connected with the rapid nervous changes of early adolescence and the corresponding arousal of new, large, confused, organic impressions, the mental unrest and uncertainty, the undefined and unclarified ideas that come at this period when fresh life is making itself felt. The rapid increment of moral motives at the time when the sense of sin declines is worthy of notice.

The males did not make as full a record of motives as the females. They were also fewer. The curves for them were not complete enough to publish. The curve for moral motives was very similar to that for females, but it was clear that the self-regarding motives did not decrease as in the case of females.

Experiences Preceding Conversion.

Just before the apparent break in the continuity of the life, there is usually a mental state known in theological terms as conviction, or the sense of sin. It shows itself by various mental and bodily affections, such as the feeling of separation from God, depression, restlessness, anxiety, loss of sleep and appetite, a weight on the mind, a burden of heart, and the like. The quotations below will furnish a picture of the general mental and bodily states. The frequency of their occurrence is given in Table V. Remorse and conviction for sin, which are very prominent, are not included in these groups in cases where they were given among the motives.

Prayer: *F.*, 18. "I grew so distressed I cried to God for mercy and forgiveness." *F.*, 17. "I felt a weight of sin; prayed not to die until I became better." *F.*, 15. "I fought and struggled in prayer to get the feeling that God was with me."

Estrangement from God: *M.*, 15. "Sense of sinfulness and estrangement from God grew on me daily." *M.*, 16. "Felt that God despised me." *M.*, 16. "Felt a lack of harmony with the Divine Being and sense of continually offending Him." There is often a feeling of separation from friends; this is doubtless of the same sort, and grows out of the individual's feeling of detachment from the whole.

Restlessness and uncertainty: *M.*, 12. "Everything went wrong with me; it seemed like Sunday all the time." *M.*, 15. "Constantly worrying." *F.*, 14. "Thought something terrible was going to happen." *F.*, 23. "Felt wrong mentally and morally." *F.*, 17. "Could not keep my mind on anything." *F.*, 12. "Couldn't work." *M.*, 19. "Felt a want, an unrest, an aching void the world could never fill."

Depression and meditation: *F.*, 13. "Thought of my condition was terrible." *F.*, 16. "For nights and days my mind was troubled." *M.*, 20. "Secret meditation while at work." *F.*, 16. "Began thinking and thinking by myself."

Self-distrust and helplessness: *F.*, 23. "Was discouraged, and felt it was no use to try." *F.*, 18. "Had suffered for years, wanting to be a Christian and not knowing how." *F.*, 16. "Awful feeling of helplessness." Other less frequent affections are: desire to better life, earnestness, seriousness, doubts and questionings.

These states are not infrequently described in physical terms: "Couldn't eat." "Would lie awake at night." "Was excited." *M.*, 19. "Felt I was carrying the world on my shoulders." *M.*, 19. "Often, very often I cried myself to sleep." *M.*, 10. "Hymns would sound in my mind as if sung." *F.*, 15. "Had visions of

Christ saying to me, 'Come to Me, my child.'" *M.*, 17. "Just before conversion I was walking along a pathway thinking of religious matters, when suddenly the word H-e-l-l was spelled out five yards ahead of me."

Tendency to resist conviction: The cases arrange themselves naturally in a series from those in which there has been a continued, earnest effort in the direction of a higher life which finally dawns, to those at the other end of the series in which there has been a more or less wayward life, the awakening of an ideal which contradicts it and a stubborn refusal to follow it. At one extreme is the striving *after* something; at the other is the struggling *against* something. All the way between these extremes are hazy conceptions, an undefinable sense of imperfection, a "wanting something and not knowing what," which give rise to the feelings of restlessness, anxiety, depression, helplessness, and the like, as shown above. Perhaps in the tendency to resist conviction one sees reflected something of the nature of conversion and the explanation of some of the phenomena following it. *M.*, 15. (Carefully trained, fell into bad associations, and came under the influence of revival.) "I resisted as long as possible by finding fault with the church and its members, saying I didn't believe the Bible, or that there was a Hell; was afraid to go to church or to bed; saw a flood of light; so happy I sang all night and couldn't sleep." *M.*, 15. "I strictly avoided any conversation tending in any way toward moral or religious topics; conviction became torture, yet I could not yield." *M.*, 12. "Sort of inward tendency to resist, which did not show itself outwardly." *F.*, 16. "I stayed away from revivals and prayer meeting for fear of giving way to my convictions." *F.*, 17. "Tried every way to escape a friend interested in me, and the minister; in prayer meeting would hold on to the seat with main force to keep from rising for prayer." *F.*, 16. "Often fought against crying, the conviction was so strong." *F.*, 12. "Would tell myself, 'You ought to join church;' then I would say, 'No, you can't be good enough.'" *F.*, 18. "Dreaded to go forward." *F.*, 13. "Knew I would have to act differently at school and make up with my teacher, whom I had offended." *F.*, 17. "I tried to throw off the feeling by saying all sorts of reckless things about God and religion."

The frequency with which the various kinds of affections show themselves is given in Table V. The worth of the per cents is more in their relative than in their absolute magnitude. Many of the records were not complete, else the per cents might all be greater.

It is evident that depression and dejection are almost always present. The disturbances are described more often in mental terms than physical. The sense of remorse, restlessness, sadness, anxiety and the like are much more frequent than earnestness and a clearly marked purpose to enter a new life. The impressions are confused and organic.

Comparing the males and females, it is evident that the duration of conviction for sin is more than twice as long in case of the former. Doubts are more common in males, and resistance to conviction is about twice as frequent. Helplessness and humility are more common in females.

It is an interesting fact that the mental and physical disturbances are greater in the revival cases among the males and in the non-revival cases among the females. Studying through the female cases alone, it is pretty clear that one reason the stress is greater with the females who are not influenced directly by revival serv-

TABLE V.

Showing the frequency in per cent. of cases of different mental and bodily affections preceding conversion.

EXPERIENCES IMMEDIATELY BEFORE CONVERSION.	FEMALE.		MALE.	
	Revival. %	Non-Rev. %	Revival. %	Non-Rev. %
Remorse, conviction for sin (recognized as a motive)	16	20	19	19
Tendency to resist conviction	33	40	80	41
Prayer, calling on God	31	40	70	70
Sense of estrangement from God	17	32	30	16
Restlessness, anxiety, uncertainty	30	60	53	16
Depression, sadness, meditation	90	80	82	70
Helplessness, humility	15	6	—	8
Desire to be a Christian	13	11	12	8
Earnestness, seriousness	9	9	—	—
Doubts, questionings	—	6	6	30
Loss of sleep	17	35	60	40
Loss of appetite	17	20	35	16
Nervousness	6	6	12	—
Weeping	6	9	6	—
Ill health	6	—	—	—
Affection of sight	—	9	12	—
Affection of hearing	6	—	6	8
Affection of touch	12	12	24	—
Average duration of sense of sin	15 wks.	36 wks.	74 wks.	63 wks.

ices is that they lack the stimulus of the crowd to carry them through difficulties that are at work in their lives when they are left to work them out alone. Modesty and reserve keep them from making their struggles known. *F.*, 11. "I began to think deeply on religious subjects. I longed for some one to talk to about them." *F.*, 16. "I began thinking and thinking by myself." *F.*, 13. "I used to lie awake and cry over my sins." The strength of sermons, the rhythm of music, the encouragement of friends, the force of example and all the impetus that comes from a religious service, often furnish the last stimulus needed to carry the restless, struggling life through its uncertainty and perplexity. *F.*, 14. "The sermon seemed just meant for me." *F.*, 23. "Was wretched and discontented. Thought it no use to try. The music appealed to me. While they were singing, was much moved and rose to my feet." Similar instances are numerous. It will be noticed from the table that in many groups of affections, they are about twice as numerous in case of non-revivals and that in these the duration of conviction is more than twice as long.

The fact that the males contradict nearly everything in the columns for females is difficult. It may be due, in part, to the larger place intellection has in males and intuition in females. These are some of the evidences. Table IV shows that the subjective forces leading to conversion are greater in males, while imitation and social pressure are greater in females. In Table V those disturbances, such as anxiety, sadness and helplessness, showing the

working of large undefined forces in the life, are more frequent in females. Doubts and questionings are 36% for males as against 6% for females. Resistance to conviction is twice as frequent in males, which is evidence of the action of contradictory ideas, or of convictions which oppose habits. The duration of conviction is much greater in males. In beginning a new life, therefore, the male, being more self-dependent and working his way more by his own insight, may find it a more bitter ordeal to conform his will to a social or moral order outside his own, and rebels. The female accepts the help of the external institutional system in working out her own life problems.

For the purpose of seeing farther into the nature of the sense of sin (using the term broadly to include depression, helplessness, and the like), the male and female cases were grouped to find how far it is the result of bad moral training and actual waywardness. Only such were used as showed in a rather pronounced way the presence or absence of immorality and of the sense of sin. Among the males, when conviction for sin or what is described in kindred terms is present, it follows actual waywardness in two-thirds of the cases. When the previous life has been fairly upright, the sense of sin is present and absent in about the same number of cases. When conversion has been preceded by waywardness, the sense of sin is absent only in one-tenth of the cases.

Among the females it is different. When there have actually been marked evil tendencies before conversion, the conviction phenomena are nearly always present, and in that the females coincide with the males. But out of the whole number of females there are more instances given in which they follow a fairly moral life than those in which they follow a distinctly wayward one. Of the cases described as of good training and of moral and even religious observance, more than two-thirds show in a marked way the sense of sin.

These facts seem to show that although the sense of sin comes naturally as the sequence of bad habits and conscious evil, it is not occasioned wholly by them, and perhaps has other causes. Its greater prominence among females of good moral training may be traceable, in part, directly to imperfect physical conditions. Hysteria and other nervous and other circulatory disorders are more common among adolescent females than males, and far more common during adolescence than later.[1] Many of the symptoms of these diseases are the same as those shown before conversion. There are evidences, too, that the extreme dejection, self-distrust, self-condemnation, and the like, are traceable, in part, to physiological causes in males. About one-third of the males gave sexual temptations as among those of youth, and nearly always it was said to be the chief temptation. In nearly all these instances the phenomena during conviction are remarkably similar to those which follow the sexual evil. These are typical: *M.*, 12. "Everything seemed dead." *M.*, 19. "Before conversion I had not a single happy day because of dread of the future." *M.*, 15. "Had fear of being lost; was pensive and worried; was greatly depressed and could not sleep." *M.*, 18. "Was troubled with fears. Thoroughly convicted of sin; was filled with remorse, and was ashamed of my condition. Had uneasiness, and for days longed for God's forgiveness." In 90% of these cases did remorse, fear of death, depression and the like enter prominently among the conviction states. A few gave escape from passion among the motives for conversion.

[1] W. R. Gower, "Diseases of the Nervous System." Vol. II. p. 985.

THE CHANGE ITSELF; CONVERSION.

(a) *Mental and bodily accompaniments.* The cases would easily arrange themselves into a series from those where there is almost no feeling accompaniment, to those at the other extreme in which there is intense struggle, the height of pain and joy, and vivid experiences quite out of the range of ordinary life. A few definite changes seem to work themselves out quietly somehow in the depths of the nature and are given ready made without emotion. *M.*, 15. "My conversion was attended by nothing unusual." *M.*, 18. "No emotion; it was a calm acceptance of the power of Christ to save." *M.*, 12. "It was simply a jump for the better." They shade off rapidly, however, into those which are wrought out with high emotion. When the feelings attending conversion were collated and compared with those during the conviction period, they were found, in general, to be much more intense. They are described oftener in physical terms than are those during the period preceding. There is evidence that the whole nature is in a high state of tension, and that the senses are much more acute. The attention is narrowed and fixed. The exact appearance of objects, the presentation of unusual sights, the exact words spoken and heard, the hymns sung, imaginary sounds, and the like, are frequently recalled with great minuteness. The experiences are more intense in the revival cases than in the others among both males and females. In the case of males this is in line with the greater intensity of the conviction phenomena in revival conversions. In the case of females it seems at first to contradict the facts given in the preceding section, viz., that the disturbances preceding conversion were greater in the non-revival cases. Here there are almost no vivid experiences among the non-revival female conversions. The explanation here may be in line with the one given in the preceding section. Females are more impressionable, and controlled more by large instinctive feelings. Left alone there is less power of positive activity in the presence of spiritual difficulties. A slight external stimulus is helpful. In the presence of the stronger forces of a revival, she is thrown often into the intensest emotion. *F.*, 16. "As the choir began to sing, I felt a queer feeling about my heart which might be called a nervous tremor. There was a choking sensation in my throat, and every muscle in my body seemed to have received an electric shock. While in this state, hardly knowing what I did, I went forward. On second night was converted and felt as if God was pleased with me." *F.*, 12. "On the impulse of the moment I went to the altar. After an hour of pleading and prayer, I felt something go from me which seemed like a burden lifted, and something seemed floating nearer and nearer just above me. Suddenly I felt a touch as of the Divine One, and a voice said, 'Thy sins are forgiven thee; arise, go in peace.'" There are several cases quite as vivid in all except the non-revival female group.

There are almost invariably two opposite kinds of feeling shown at the time of conversion. The first are those of the conviction period, magnified until the subject is brought to the last degree of dejection, humility, confusion, uncertainty, sense of sinfulness, and the like. The second seems to be the relief from the first and is characterized by such feelings as joy, elevation, free activity, clarified vision and oneness with God. It appears to be the intensest form of those feelings which shade off into the post-conversion experiences. These two kinds of feeling are often completely mingled and blended. *M.*, 75. "Was despondent; went out of doors and cried; felt my heart lifting and couldn't sit still." *F.*, 12. "Felt

sad over my sins, yet an inexpressible feeling of gladness came over me." *F.*, 19. "I read books and reflected; saw my lack; knelt and prayed, putting happiness into every breath, and beauty into everything." *F.*, 16. "With tears came relief and joy."

That the feelings within this point of great mental tension, and activity are so blended, and that so much is worked out in so short a time, makes adequate self-analysis impossible and increases the difficulty and interest of the study.

The two opposite kinds of feeling are more often successive, and their point of separation is pretty clearly marked. In throwing the cases together, each of these divisions fell into two more or less distinct classes. First, those connected with the feeling of sinfulness proper, which are negative and result in dejection and self-abnegation; and secondly, those which involve a struggle after larger life, and are largely positive, but often accompanied by uncertainity and distress. The general character of the separate groups is illustrated below.

1. *M.*, 19. "I mourned and wept and prayed, and stood trembling, with tears in my eyes." *M.*, 15. "Prayed earnestly for pardon; willing to do anything for Christ." *M.*, 16. "Felt the weight of sin as a burden on my mind." *M.*, 37. "Didn't care whether I lived or died." *F.*, 14. "Past life was source of great regret to me. Conviction came so strong at 14 that I thought I would die that very summer if I did not get relief; often worried and lost sleep; one evening after retiring a queer sensation came over me; it was very dark, as though passing through something and God was right over my head; I trembled intensely and became exhausted and helpless."

2. *M.*, 16. "Inexpressible joy sprang up in my soul." *M.*, 12. "Saw a flood of light, and faces in room seemed to reflect the bright light." *M.*, 15. "While praying I seemed caught up into the presence of Jesus." *M.*, 19. "Perceived a load go off." *F.*, 12. "I had a sudden transport of joy; wished I might die right then and go to God." *M.*, 17. "The emotion suddenly broke and I was convinced of the atonement of my sins."

3. *F.*, 15. "I prayed day after day, struggling for light." *F.*, 10. "The chief trouble was I did not feel myself as great a sinner as I ought." *F.*, 16. "Felt the need of a religion; read book and thought over it; was beginning to despair." *M.*, 23. "Prayed and cried to God for help; wandered four years seeking rest; went to many a priest for comfort."

4. *F.*, 15. "While struggling in prayer peace came to me through the darkness." *F.*, 10. "Came to have a feeling like I do now when a thing is right." *F.*, —. "New light seemed to dawn in me." *M.*, 23. "When all outward help failed a voice came which said: 'There is one, even Christ Jesus, can speak to thy condition'; and when I heard it my heart did leap for joy." *F.*, 13. "I could fairly see the gospel truths, which had always been misty."

Groups 2 and 4 are very similar; 1 and 3 show somewhat distinct mental states and processes. They may be characterized respectively as the *sense of sin* and the *feeling of incompleteness*. The sense of sin is attended by feelings of wretchedness, heaviness, helplessness, weariness, sensitiveness and resistance, separation from friends and God, fear, resentment, and so on, which are followed after the crisis by joy, peace, rest, lightness of heart, oneness with others and God, love, exuberance of spirits, sense of free activity, and the like. The feelings are reduced to the last degree of tension, and then recoil; are pent up, and suddenly burst; the life appears to force itself to the farthest extreme in a given direction and then to break into

free activity in another. The feeling of imperfection or incompleteness has slightly different accompaniments. There is uncertainty, unrest, mistiness, dazed feeling, distress, effort, struggle toward an indefinite something, longing for something out of reach, etc., which is followed by peace, happiness, a sense of harmony, a clearing away, a flash of light, freedom, entrance into new life, and so on. Something like what the cases show is represented graphically in Figure V.

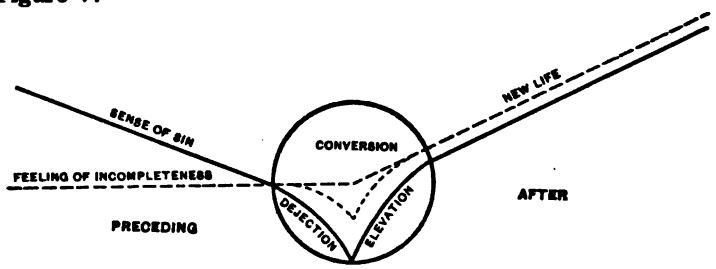


FIGURE V. *Illustrating roughly the mental processes at conversion as shown by the feeling accompaniments.*

The meaning of these phenomena can be discussed better later. Those attending the sense of sin are more characteristic of each of the cases above 27 years of age and of the younger subjects in which there has been definite waywardness. The feeling of imperfection and its accompaniments seems to be a normal adolescent experience. It is often attended, also, by mental depression, but not so frequently as is the sense of sin.

(*b*) *In what conversion consists.*

Just what happens at conversion is hinted by the surface phenomena which can be put into words by the subjects. Nearly all the persons answered questions IV of the syllabus completely enough to give some glimpse of the mental state at the time of conversion, and a few had a distinct feeling of something taking place in their natures. Two persons illustrated graphically what happened by drawing lines. In both, conversion was pictured by a rapidly ascending curve. When the states and processes thought to be central were collected, they formed seven classes, of which instances are given below. In order to see what peculiar conviction state the separate groups are most apt to follow, a record was kept of the frequency with which each followed one or all of these five conviction phenomena, — remorse (conviction, dejection, etc.), estrangement from God (and friends), resistance (to conviction), prayer (calling on God, etc.), and positive effort (in the direction of new insight).

1. Yielding, self-surrender, breaking pride, etc.: *M.*, 15. "I finally gave up trying to resist." *M.*, 18. "Wanted to be a lawyer; was not willing to do the work God called me to do; after much prayer I surrendered completely and had the assurance I was accepted." *F.*, 13. "I knew it would be best for me, but there were some things I could not give up; when relief came all pride was gone." *F.*, 17. "Had said I would not give up; when my will was broken it was all over." Self-surrender generally follows remorse, resistance and prayer, but seldom follows estrangement and positive effort.

2. Determination, making up mind, etc.: *M.*, 19. "Determined

to yield my heart and life to God's service." *F.*, 13. "One day made up my mind I would be for Christ always." *F.*, 18. "Made up my mind to be a Christian regardless of feeling." *M.*, 18. "It was deciding for the sake of doing right and for influencing others." Cases in this group rarely follow any of the above mentioned conviction states except positive effort and tendency to resist. The cases are interesting, in which there is a sense of expenditure of effort in the act of yielding.

3. Forgiveness: *F.*, 13. "Felt the wrath of God resting on me; called on Him for aid; felt my sins forgiven." *F.*, 16. "Felt God's forgiveness so distinctly." *M.*, 15. "Seemed to hear Jesus speak words of forgiveness (a purely mental experience)." *M.*, 15. "Gradually the sense came over me that I had done my part and God was willing to do His, and that He was not angry with me; I had sense of sins forgiven." Forgiveness generally follows remorse, less often estrangement, resistance and prayer, and seldom follows positive effort.

4. God's help, or presence of some outside power (generally not involving forgiveness): *M.*, 19. "By God's special grace and help I sought peace publicly and found it." *M.*, 27. "I saw the words, 'Without blood there is no remission,' and the Holy Spirit sealed them to my heart." *M.*, 15. "Felt sure I had received the Holy Spirit." Usually follows remorse; less frequently after the other symptoms.

5. Public confession: *M.*, 15. "Did feel that in taking this public step I had crossed the Rubicon." *M.*, 13. "Held up my hand in prayer meeting as a profession of faith in Christ." *F.*, —. "I rose for prayer and felt relieved." *F.*, 12. "At the call for those who wished prayer, I was immediately on my feet, and it seemed as if a great burden had been removed." Public confession seems often closely akin to forgiveness and the sense of harmony with God, the sanction of the church and approval of friends standing for the more abstract relation. It is also closely related to breaking pride and self-surrender. The conviction symptoms preceding it, except estrangement and prayer, are all present in about half the instances.

6. Sudden awakening: *M.*, 22. "Got to attending revivals and thought much over my condition and how to know I was saved; everything depended on 'Him that cometh unto me,' etc.; cometh was the pivotal word; one evening while walking along the road it came to me that it was all right now." *M.*, 11. "After failing of relief at revival, was singing songs by myself at home; after I got through singing I sat and thought, 'Why, God does forgive me and if I live right He will help me.'" *M.*, 37. "Had been a drunkard for years; struggled against my better sensibilities; attended city mission; read Bible and prayed far into night; went to sleep and during night the thing had cleared itself up in my mind, and I was ready to live or die by it." *F.*, 13. "For four years I had wanted to be a Christian but could not feel my sins forgiven; one morning sitting in my room reading, peace just seemed to come, and I was happy indeed." *F.*, 16. "The awful shock of mother's death seemed to awaken me from the state I was in and make me determined to do better." Such cases generally have some probable direct antecedent in thought or action which temporarily fades away and is revived as a finished result. They are preceded frequently by all the conviction symptoms, with remorse, prayer and positive effort in the predominance.

7. The sense of harmony (oneness with God, etc.): *F.*, 13. "Felt that God had sent peace to me." *F.*, 17. "Felt God had accepted

me." *F.*, 11. "Felt presence of God and found relief." *M.*, 17. "It was a sudden awakening, so I could say in my heart, 'Our Father in heaven.'" *M.*, 14. "I knelt and prayed; I seemed immersed for the moment in a larger being, as though it had closed about me; I felt sure I had received the Holy Spirit." The idea of oneness is also involved in forgiveness. The sense of harmony frequently follows remorse and prayer; less often estrangement, resistance and positive effort. There is evidence that mere imitation is a strong factor in conversion, and there is nothing new to be said of it here. The elements considered here only include those cases in which the subjective forces were strongly marked.

The relative frequency of the various elements thought to be central in the change are given in Table VI. The same person often mentioned facts which came under two or more of the seven headings. The per cents were distributed so that the sum of the columns gives a hundred per cent. The figures do not show, therefore, the per cent. of cases in which each element enters, but their relative prominence.

TABLE VI.

Showing the relative frequency of certain things regarded as central in conversion.

THAT IN WHICH CONVERSION CONSISTS.	MALES.		FEMALES.		TOTAL.	
	Revi'l. %	Non-R. %	Revi'l. %	Non-R. %	Male. %	Fem'e. %
Self-surrender	15	—	12	11	10	12
Determination	3	11	4	15	6	8
Forgiveness	28	11	19	8	22	14
Divine aid	5	18	6	6	10	6
Public confession	17	7	19	15	14	18
Sudden awakening (Spontaneous?)	17	32	27	28	21	27
Feeling of oneness (With God, friends, etc.)	15	21	13	18	16	15

The table shows that the order of prominence as shown by the frequency of the different factors is: spontaneous awakening, sense of forgiveness, finding oneness with God, public confession, self-surrender, an act performed by divine aid, and lastly the exercise of will by the subject.

Comparing the males and females, it is seen that, self-surrender, determination, sudden awakening and public confession are more frequent among females. This harmonizes with the previous comparisons. Their feeling and volitional powers seem to be more highly developed. Sensitiveness to surroundings also helps account for the prominence of public confession and self-surrender. Each of these often means the breaking of pride and falling in line

with the ensemble. Forgiveness and the recognition of external, supernatural aid is more common among males.

The revival cases show some marked contrasts with the others. Self-surrender, forgiveness and public confession are more common in the former, while the force of will, spontaneous awakening and the sense of harmony are more essential factors in the non-revival cases. Yielding is entirely absent in non-revival males. That it is so frequent among non-revival females is explainable by the fact that so many of them occur in regular church services. The same thing explains the variance of the numbers for public confession. In general those factors more prominent in revival cases are such as naturally follow external pressure, while the others are such as require the natural awakening and exercise of subjective forces.

These are the facts as given by the subjects. An attempt at the interpretation of the life forces at work which produce them will come later.

(c) *The conscious element involved in conversion.* The term conscious is used diversely. Its use here is very general. It stands for the undifferentiated centre at which intellection and volition separate. It represents an element of purpose, insight and choice as distinguished from mere response to environment, reaction to physiological stimuli and blind determination. This is the most uncertain division of the subject. It requires evaluation at every point, and so the chance for error is heightened.

An interesting feature of the foregoing facts is the apparent smallness of the intellectual factor among the conscious motives to conversion, and also of the volitional element at the time of the change. For example, during the conviction period, conscious following out of teaching was mentioned in only 7% of the cases, and a response to moral ideal in only 20% of them; while external forces were recognized in 40% of them. We have first seen that the conscious exercise of will was rarely mentioned as being central at the time of conversion. That an apparently spontaneous awakening is the most prominent factor in the change, increased the evidence that the process is automatic. Public confession may mean that the subject is driven by surroundings. The sense of forgiveness and oneness with God also generally indicate that the experience is worked out in the sphere of feeling. There are, however, many evidences of the presence of conscious purpose. It is often mentioned as a recognized factor. Besides, the cases show that public confession is often made in spite of adverse surroundings. Self-surrender generally means that the subject is drawn between two possible courses, and must decide between them. The persistent struggle often shown during conviction, sometimes toward a definite end and sometimes toward a dimly defined one, indicates the presence perhaps of incipient ideation and volition.

In order to arrive at an estimate of the conscious concomitant, the cases were studied through with that alone in view. They were separated into five classes, as determined by the prominence of the conscious element: First, where it is absent, or nearly so; these are largely cases of imitation, adolescent ferment, and the like; second, those in which it is small; third, those in which the conscious and automatic forces are about equally balanced; fourth, in which there was apparently a predominance of insight, and moving along a clearly marked course; and lastly, those in which the conscious element seems without much doubt to be the determining factor. The following instances of each class will give an idea of the standard of evaluation:

1. *M.*, 15. "Began largely as imitation; a friend told me I was not free from liability to divine displeasure." *F.*, 8. "At camp meeting I went to the altar with twenty others; in the uncertainty at the altar I repeated after the leader,' I believe Him;' I knew I was converted; afterward had great comfort in Bible reading and prayer, and in times of anxiety."

2. *F.*, 11. "From my earliest days I had wanted to be a Christian; I felt desire, unrest and fear; many were going forward at the revival; that made it easy for me; I made confession by speaking in meeting, and felt the peace of God." *M.*, 14. "I was influenced by example of father and mother; besides this I had a sense of duty; was afraid of being lost; felt I was not good enough to become a Christian; I broke my pride and made public confession."

3. *F.*, 16. "Deeply convicted of sin; for three weeks I spent much time in prayer; had awful feeling of helplessness; relief came during a revival; I made up my mind the Sunday before that I would rise for prayer; I think it came through my own thought and deliberate choice." *F.*, 14. "Thought a great deal about the after life, and knew I must decide; I had a sort of depressed feeling, and I engaged in prayer; three days after making up my mind relief came by feeling God's forgiveness."

4. *F.*, 14. "Had unsatisfied feeling and craving for a higher life; fought and struggled in prayer to get feeling that God was with me; with the greatest effort I endeavored to get some glimpses of light; while struggling for light peace came to me through the darkness, and I felt at rest." *M.*, 18. "Wanted to make the most possible out of life and to exert the right influence over my pupils and young people; it was also a divine instinct, gratitude for blessings received, that led me to make a personal choice; I decided the matter at home that I would not only be partly right, but wholly right."

5. *F.*, 18. "The change was purely in making up my mind I would live as Christ would have me, whether certain feelings came or not; felt happy and satisfied." *M.*, 12. "Seemed only deliberate choice gradually growing and reaching its climax at conversion; duty I owed to Christ, who had done so much for me, was the chief factor; my conversion was just a jump for the better in the direction of the gradual growth which had preceded."

According to the above standard of classification the cases resulted as shown in Table VII.

It is seen from the table that there are a few cases only in which the conscious element is either absent or apparently the principal determining factor in the change. Most of them fall in between these extremes where the conscious and unconscious forces act together and interact on each other. They arrange themselves in a series from the almost wholly externally determined conversions to those which come with clear insight and controlled largely by subjective forces. Age has much to do with the place in the series into which any case will fall. It will be noticed that in both males and females the average age increases gradually with the increase of the conscious concomitant. The males form a pretty regular series, there being about the same number in which the conscious element is present and absent, and great and small. The females fall more on to the side of the automatic. 19% of the females belong to the first class, as opposed to 2% of the males, and as against 3% at the other end of their own series. This harmonizes with the facts under the discussion of the motives and the conviction period. The

consciously self-directing forces are less in females. It is somewhat opposed to the facts in the present section in regard to the volition element in conversion. Determination was more frequent in females. That is not incongruous, since the organic push in females which results in determination is mainly volition, and is more akin to feeling than is intellection proper. The revival cases

TABLE VII.

Showing the result of an attempt to estimate the degree of the conscious element present in conversions.

Conscious Element.	Male.		Female.	
	% of whole Number.	Average Age.	% of whole Number.	Average Age.
Conscious element Absent	2	11	19	11.8
Less than unconscious	34	13.6	42	13.2
Equal to unconscious	36	16.2	19	14.6
Greater than unconscious	26	17.4	17	15.4
Entirely dominant (or nearly so)	2	18	3	17

form a different series from the others when taken separately. They throw the greater number into the first two classes, while the non-revival throw more into the last two. It is not the influence of the revivals, simply, that throws the greater number of females into the first two classes. In part it is due to the fact that adolescent ferment is more common and earlier among females. In general it appears that among males the conscious and automatic forces are pretty evenly balanced, and that in females the automatic are in predominance.

The importance of the conscious element is not simply in its presence immediately at conversion. Without exception, the cases studied, no matter how suddenly the new life bursts forth, have antecedents in thought or action that appear to lead up directly to the phenomenon of conversion. The picture seems to be a flow of unconscious life rising now and then into conscious will, which, in turn, sets going new forces which readjust the sum of the old thoughts and feelings and actions. Whether the flow of physiological processes first gives rise to the thought product, or whether the incipient conversion holds a causal relation to the flash of new life and activity, cannot be determined. So much is clear, that before and during conversion, the two things go together and interact upon each other. The whole conviction period seems to be a disturbance in the automatic, habitual processes caused by the presence of an awakening but still dim and confused idea. The life is continually prodded by forces from without. Reverses in life, deaths, the example of a beautiful personality, ideas from other

people, the demands of established institutions, and the like, are frequently mentioned as among the things which shake the life from its self-content, and lead it into a recognition of a larger world than its own. The way in which a thought or an experience leaves its impress and works itself out in the sphere of the semi-conscious is best shown by some typical cases. *F.*, ?. "A year before my conversion I had been to the altar, but felt no better; I wasn't ready to become a Christian; the following year, during revivals I felt more in earnest than ever before; went to the altar two nights in succession; I went in spite of my friends; a friend came and spoke to me, and it came over me like a flash of lightning that I was saved; I remember distinctly what different persons said to me afterward." Here is shown an effort by an unripe nature, a year of perseverance, and at last under favorable surroundings the thing sought for came like a flash. The high mental tension at the time of conversion is shown by permanence of the impressions made on the senses. One young woman writes: "The change came in the ordinary course; no one else had anything to do with it; I know no cause." But in describing the preconversion experiences she says: "The fears of being lost set me to thinking; I regretted my moral negligence; for six months nothing gave me any rest, and I engaged much in prayer." *M.*, 15. "Felt self-condemnation at having done wrong; at the end of ten days went into the bed-room and prayed; 'Jesus take me,' is all I said; as I rose and walked across the room it came to me that I was sincere and my prayer was real, and I believed my acceptance with God." Sometimes the experience which precedes the change is weeks and even months of intensest thought, struggle and prayer. Often the thought or act which sticks in the life and seems to prepare it for the awakening is very small. This may depend on the ripeness of the life for the new experience. *M.*, 19. "Knowledge of sin had ripened into the sense of sin; at church one sentence in the sermon caught my attention, though I was usually inattentive; the impression faded away immediately; two days later while in business, there was a sudden arrest of my thought without a consciously associated natural cause. My whole inner nature seemed summoned to a decision for or against God; and in five minutes was followed by a distinctively formed purpose to seek Him; it was followed immediately by a change, the principal manifestation of which was a willingness to make known my decision and hope of divine forgiveness." These antecedents to the change are numerous and various. They are determination to yield, longing, effort, performing some act, serious thought, and the like. That they should help work out a transformation of character seems to follow the physiological law stated by Dr. Carpenter, that the nervous system grows to the modes in which it has been exercised. When there is a longing or striving in a given direction, that very act predisposes the nervous system still farther to grow in the same direction. A certain teacher of music says to his pupils: "Just keep on trying and some day all of a sudden you will be surprised to find yourself playing." Other analogies will be given in the next division. Another principle which seems to be clearly involved in the sudden changes of this type is one of assimilation. When the mind is once disturbed, it cannot rest until harmony is restored. The necessity for mental and spiritual harmony when once a new and foreign element is introduced, is clearly the occasion of much of the disturbance during conviction. Conversion seems to be a feeling of ease, harmony and free activity after the last step of assimilation and readjustment has been made. There are many analogies to this in both physio-

logical and mental processes. In using the Ebbinghaus series in the study of memory, Dr. Theodate Smith finds that in using successive series, the forgotten members of a previously used series are more apt to come up in a later series than those which were remembered in the earlier series. The mind seems to have a way of working ahead at its difficulties unconsciously and even during sleep. In fact much of that which appears unaccountable in sudden religious awakenings is much in harmony with what is sometimes called "unconscious cerebration."

(*d*) *The unconscious or automatic element in conversion.* The conscious factor nearly always operates in connection with a large amount of the spontaneous. In many cases relief from the sense of sin persistently refuses to come until the person ceases to resist, or to make an effort in the direction he desires to go, and throws himself back on—what? Some instances of self-surrender have been given. A few others will help show the process. *F.*, 19. "I had two years of doubts and questionings. It was my disposition to look at everything intellectually; I found I must give myself up into Christ's hands; I stopped thinking about puzzling questions; I had faith in Him and found peace." *F.*, 13. "After seven days of anxious thought and meditation, I gave my heart to God, and He sent peace; the feeling came,—how, cannot tell." *M.*, 15. "After I had done everything in my power, it seemed that the change took place; I saw I had depended too much on my own power." *M.*, 45. "All at once it occurred to me that I might be saved, too, if I would stop trying to do it all myself and follow Jesus; I determined right then to test His power and love; while at the altar I determined I would live a Christian life the remainder of my days, whether I felt forgiven or not; somehow I lost my load." *M.*, 15. "I finally ceased to resist and gave myself up, though it was a hard struggle; gradually the feeling came over me that I had done my part and God was willing to do His." The physiological terminology for this so common occurrence, of processes working themselves out unconsciously is, "nervous functioning." The psychologist calls them automatisms. The philosophical designation of it is often "the universal working itself out through the individual." The theologian usually attributes the process to some personal agency outside the self—God, Holy Spirit, etc., and calls the act of yielding "self-surrender," the confidence that the new life will spring forth, "faith," and the assurance that the change has taken place, "salvation," "regeneration," etc. The likenesses to this so important element are numerous. A certain music teacher says to her pupils after the thing to be done is clearly pointed out and has been attempted unsuccessfully, "Stop trying and it will do itself." Holmes disavowed having written his best poems. They were written for him. Other analogies will be given later.

In the cases studied in which the various steps could be distinguished, the order seems to be: conviction, seeking, self-surrender, faith and assurance. The steps are often so completely mingled that no distinction can be made between them.

Post-Conversion Phenomena.

(*a*) *Feelings immediately following conversion.* The feelings which come directly after conversion are generally the opposite to those which come before. The most frequent are joy, happiness, peace, sense of relief, etc. Not infrequently do the feelings express themselves in physical terms, such as weeping, bodily lightness, improved health, and the like. The general nature of the feelings is

shown by the following: *F.*, 18. "Happiness intense; wanted to sing, but all the house was quiet." *M.*, 12. "Was very happy; sang all night and couldn't sleep." *M.*, 15. "Joy almost to weeping." *F.*, 16. "Wept and laughed alternately; was as light as if walking on air; felt as though I had gained greater peace and happiness than I had ever expected to experience." *F.*, 17. "A sudden peace and rest seemed to come over me; I felt completely, perfectly and quietly happy." *M.*, 15. "I felt my face must have shone like that of Moses; had a general feeling of buoyancy; greatest joy it was ever my lot to experience; felt as if I had been in the very presence of Deity." *M.*, 19. "I felt relieved and filled with fresh courage." *F.*, 14. "I felt as if a load were lifted from my body, and I was very happy."

A few of the cases vary somewhat from the above. Among the feelings mentioned, are zeal, earnestness, seriousness, hopefulness, subdued feeling, continued struggle, and anxiety about future conduct.

A record was made of the conviction phenomena and the experiences at conversion which had preceded the various kinds of feeling after conversion. Among the significant things in the tabulation are: Joy, happiness and peace are most apt to follow remorse, sudden awakening, public confession and sense of forgiveness. In their intenser forms they seldom follow imitation, determination, self-surrender and sense of oneness with God. Where there is positive effort preceding conversion, these feelings afterward are most frequently of the milder degree of intensity. The sense of relief follows remorse, resistance, prayer, sudden awakening, public confession and sense of forgiveness. It more frequently follows resistance than does any other feeling. It generally comes after those states which denote mental tension. The bodily affections also most often follow the more intense previous experiences.

(*b*) *The character of the new life.* The things most frequently mentioned as characteristic of the new life are: conformity with the conventional forms of religious observance, such as prayer, Bible reading, attendance at church, etc.; and various indications of the deepening of religious life: meditation, private prayer, positive religious effort, performance of duty, and acting from more ideal motives. In the tabulation the cases were kept separate, in which conformity to established usages involved personal insight and spontaneity. The non-revival cases fell mostly into this class; the revival cases for the most part seemed to conform uncritically to the conventional standard.

An important feature of conversion is that it brings the individual into closer relation with the objective world: persons, nature and God. The nature of this changed attitude is suggested in the following: (1) Relation to persons: *F.*, 13. "Began to work for others; immediately was anxious that all should experience the same." *F.*, 17. "Had more tender feeling toward family and friends." *F.*, 16. "Spoke at once to a person with whom I had been angry; felt for every one and loved friends better." *M.*, 19. "Felt everybody to be my friend." (2) Relation to nature: *M.*, 16. "Stars never have appeared so bright as that night going home." *M.*, 13. "Had special feeling of reverence toward nature." *F.*, 12. "Seemed to see God's greatness in nature." (3) Relation to God and Christ: *F.*, 11. "God was not afar off; He was my Father, and Christ my elder Brother." *F.*, 14. "Fear of God was gone; I saw He was the greatest Friend one can have." *M.*, 14. "Felt very near to my God." *M.*, 15. "Felt in harmony with everybody and all creation and its Creator."

The result of tabulating the cases in which the changed relations occur is shown in Table VIII.

TABLE VIII.

Showing the per cent. of cases in which a changed attitude toward persons, nature and God was mentioned as the result of conversion.

	MALE. In % of cases.	FEMALE. In % of cases.
Desire to help others	25	25
Love for others	43	42
Closer relation to nature	36	32
Closer relation to God	48	47
Closer relation to Christ	5	6

It should be noticed that in this table, as in all the preceding, the figures represent the lowest possible estimate, since they show the number of cases only in which the phenomenon was sufficiently prominent to receive explicit mention. It is clear, therefore, that in a large per cent. of the cases an immediate result of conversion is to call the person out from himself into active sympathy with a world outside him.

(c) *The permanence of conversion.* When there is sufficient maturity to enter conversion understandingly, relapses from the first experience are rare. It seems to be a natural entrance into a larger life, which easily becomes one's own. Where the subjects are hastened into the change, backsliding is frequent. An adequate discussion of relapses will come more properly in another paper. The central facts in regard to it will be seen in Table IX.

TABLE IX.

Showing the per cent. of cases in which the results of conversion were temporary or permanent.

PERMANENCY OF CONVERSION.	MALE.				FEMALE.			
	Revival.		Non-Rev.		Revival.		Non-Rev.	
	%	Age.	%	Age.	%	Age.	%	Age.
Relapsed	48	13.7	24	17.5	41	12	14	16
Permanent results	15	17	35	18.7	14	14.3	17	15.3
Uncertain	37		41		45		69	

The relapses include all cases in which there was a definite retrogression from the first experience, whether regained or not. A few were permanent relapses. It is seen that relapses after revival experiences are twice as frequent among males and three times among females as after the non-revival experiences. In the revival cases relapses are three times as frequent as permanent results, while in non-revival cases permanent results are more frequent than relapses. The relapses are generally among the younger persons.

Other Experiences Similar to those of Conversion.

For the purpose of finding whether the phenomena of conversion were unique or only in line with other normal experiences of common occurrence, the questions in group C of the syllabus were added. They brought in a large mass of valuable data. Space does not admit a complete organized presentation of the facts, but a few illustrations will be appended to show certain features in the other experiences which are analogous to conversion.

(*a*) *Conflicting tendencies:* The following facts illustrate the possibility of slipping into inharmonious relationship with environment. It is the pull between selfish inclination and the sense of ought. It leads into the condition represented by No. (1) of Figure VI. *F.*, 19. "My mother had positively forbidden me to visit one of my friends, and many times I willfully disobeyed her, because the attraction of my friend's society was stronger than my sense of right." *F.*, 17. "Used to be fond of jumping rope; mother forbade me; at school I disobeyed because I thought mother need never know of it; all the other girls jump ropes without falling dead, and I wouldn't meet with any accident either." *F.*, 9. "Refused to sing at a school entertainment because mamma would not let me wear a certain dress; I felt satisfied to think I got out of singing it, but felt an inward voice chiding me; on the whole I thought I was a very bad girl, and did not want to think of it."

(*b*) *Depression and joy:* The feelings of accompanying uncertainty in the presence of two or more alternatives and the final decision between them, illustrate the feelings during conviction and after the conversion crisis. *F.*, 20. "For a year or more I had something on my mind which I felt I ought to tell mother; at last I came to feel that I could not stand it any longer, and that I must do something to relieve me of this constant feeling that I ought; felt very nervous and worried; was determined to tell her, but felt afraid my courage would fail; with my heart beating very fast I followed her to her room; felt so relieved when it was over I hurried to my room and laughed and cried at intervals; still felt nervous, and trembled somewhat for a little while afterward; after that I seemed to forget everything connected with my old wrong, and I felt that I had gained a great victory over myself." *F.*, 18. "When 14 was undecided whether to go away from home to school or to public school at home; I used to think about it continually until I lost my appetite, and became so cross and fretful that my brothers told me that I had better go to T— away from home, as I was a little crank; I decided to go away, and after I once decided it seemed as if a great load had left me, and I was free again." *F.*, 17. "Uncertain about choosing profession; was in a state of perplexity and restlessness; could not lie down to restful sleep; felt to a certain degree depressed; was anxious for decision, because I knew it must come; when struggle was ended, feeling of relief and rest came; almost seemed as if I had entered new world." *F.*, 27. "Most difficult decision was choice

of profession; lasted for years; began with a vague desire, and became more and more definite and clear through successive periods of waiting and effort; first part of time had many tears; some feelings of anger and rebellion; many doubts; decision came gradually; seemed to grow; feeling of decision was that of lifted burden, and seemed to me like that of a person who has climbed a hill—notices he is breathless, but feels at liberty to sit for a moment for breath, while he looks backward and forward." *F.*, 19. "A year ago was uncertain whether to break friendship with girl; thought she exerted harmful influence, but I liked her very much; took over a week to make decision; all that time had fear and depression; could not sleep well, and lost appetite; one night as I lay in bed I felt I must decide; for a few moments there was a struggle in my mind that almost amounted to pain; then I resolved to break off friendship; after struggle felt sense of weariness as well as of peace; felt just as if I wanted to rest awhile and soon fell asleep." *F.*, 37. "Since conversion have had same feelings when trying to decide some important question; after making the decision, in trying to decide which way is best, there come the same peace and rest." It is seen that both the bodily and mental accompaniments in these instances of uncertainty and relief are the same as those preceding and after conversion.

(c) *Sudden awakenings:* These instances of sudden and apparently unaccountable awakenings of power and insight are analogous to the larger spiritual awakenings, and like them, are, so far as any adequate explanation goes, mysterious and "supernatural:" *M.*, 4. "Little boy 4 years old could not talk; made queer sounds for different objects; all at once he began to talk, and said his words plainly; could soon say everything he heard." "Little girl I knew well could not sing a note or carry a tune; suddenly one day she came in singing 'Sweet Marie' in sweet, clear voice." *F.*, ?. "I was very anxious to learn to play the piano, and would spend hours at the instrument; one day I suddenly found I could play a little waltz my sister had given me; this incited me to try another piece, and I found I could play that." *F.*, 19. "Tried to learn to mount and dismount a bicycle, until it seemed to me there was no use in trying any more; all at once one night I found I could do both easily." *F.*, 19. "Studied physics under good teacher, but could not see into it; went home feeling sick, discouraged one day with a problem: why do we see ourselves upside down in a spoon? Studied over it for an hour; it seemed dark; suddenly it seemed lighter; then I saw the reason as clearly as I ever did anything; I felt so glad, and the physics problem was solved forever in my mind; I liked the study, and could understand it; I cannot explain why it was." *F.*, 27. "At 14 studied etymology and mensuration; thought I could never understand them, and felt quite discouraged; after hearing pupil recite one day power to do them came like a flash, and they became favorite studies." *F.*, 19. "Could not understand subtraction in algebra; could not even do the examples mechanically; failed every day in it; suddenly one day, while working alone, it dawned on me, and since then I have had no trouble; it is the easiest thing in algebra now." *M.*, 27. "My students and I had worked several days on a problem in geometry; one night I went to bed after trying again and failing; the next morning on awakening the solution of the problem was so distinct before my mind I saw it in visual terms." *F.*, 22. "When grandmother died everything seemed so dull and dreary, as if a dark cloud hung over me; couldn't seem to get comfort from anyone or even prayer; when I prayed seemed as if words had no meaning at

all; was in this condition more than one month, when suddenly cloud broke away and I found comfort in my Bible." *F.*, 27. "With sudden flash I saw meaning of, 'And ye shall know the truth and truth shall make you free;' perception had almost character of physical thrill; power to perceive grew gradually in experience; the perception was sudden." *F.*, adult. "Had married; husband was jealous of my love for my invalid sister, who had lost her health for me; forced me to leave her; went back to her with my baby, and was able by teaching music to make scanty living for three; husband begged me to return west; I refused, though I was heavily burdened; my judgment told me to stay, but my heart yearned after him; I went to God and wrestled in prayer half the night; at 2 o'clock peace came; He took away my love for my husband; it left me in an instant, and has never returned; now I feel free." These changes are especially similar to the conversion experiences which follow what was called the sense of incompleteness.

(*d*) *Sudden changes:* The following illustrate the sudden break in character at conversion: "I disliked bananas very much; one day on tasting one I found I liked them very much, and since cannot get enough of them; it was just the same with cooked onions." *F.*, 9. "When about nine was very fond of bananas; cousin gave me all I could eat; became sick at stomach; after that had same sick feeling whenever I saw bananas." *F.*, 17. "Never could bear taste of turkey; two years ago was visiting and had to take it or be rude; have liked it ever since." *M.*, 21. "To one particular fellow in our club I took a great dislike; he never did anything to me; always treated me kindly; I never knew why I disliked him." *F.*, 18. "Knew girl whom I thought great deal of; one day I happened to think of her, and just then I felt that I didn't like her at all; seemed strange to me, and I thought I could not dislike her; but all her bad traits stood out before me, and I couldn't see anything in her to like at all." *F.*, 17. "I once had a teacher whom I simply detested; I detested her so much that I thought of her constantly; one day I happened to pass her in the hall; I do not know what she did, in fact I think she did nothing, but just as quickly as she passed me my hatred turned to love; I know it sounds foolish to speak of loving anyone like that, but I positively adored her." *M.*, —. "Little nephew played unceasingly with little niece; when she died, from being a gay little fellow he became sad, and has been of a sallow and cranky disposition ever since." *F.*, 18. "Was always being teased when I was small, so that small things made me very angry; when in an angry fit one day a little girl friend came in; I told her sharply to go home; she went and became very ill; I never got into such states any more." *M.*, 5. "When about five displayed violent temper; one day in unrestrained rage I chased next older brother around yard and into house, hurling things at him like a young gorilla; my mother was so concerned about me that she wept (she was not the sort of woman to 'cry') in genuine discouragement, and said she didn't know but I would have to go to the reform school; I truly repented; after a short nap I sought her good will, and ever afterward was noted for obedience and docility." "Uncle had horse which was great favorite and as gentle and docile as could be; was once frightened by a fire engine, and after that he became so vicious that it was not safe to drive him." "Knew of a horse which delighted in kicking, biting and running away; its owner was afraid even to feed it; he gave it away; the new owner geared the horse to drive it home; it tried to kick; he gave it a good beating; he never had any trouble

with it after that; he would let it stand without tieing." *M.*, 5. "The child of my friend was much spoiled; while I was with him the child became unmanageable; the father held him firmly several hours; at last the child stopped kicking and crying and said, 'Papa, I love you,' and was good after that." "Young man took school; boy nearly as old as he spit tobacco at him first day; teacher measured him, and decided he could shake him; almost an even match; succeeded in giving him sound thrashing; after that day boy was his admirer." *F.*, ?. "My music teacher asked why I hadn't practiced a certain thing; I said, 'Because I didn't want to;' she said, 'that is a very bad habit; do you always expect to do what you want to in this life?' No one can ever expect to; immediately made up my mind never to do things very agreeable to me; from that minute I was a different person; felt it was almost wicked to do things which I liked, and sought disagreeable things to do; did it just because I was convinced it was the right way to live." *F.*, ?. "When a child I got in the habit of putting my thumb in my mouth at night; my parents did everything they could to break the habit, but did not succeed; when about six I became ashamed of the habit, so one night I lay on my hand all night; I never put my thumb in my mouth again at night." *F.*, 17. "Broke slang habit; put papers over bureau, washstand and bed with words, 'Don't use slang;' took paper and wrote every word of slang that slipped; before I broke habit was discouraged, discontented, and in small way angry with myself; after I succeeded I was happy, and the words that came from my mouth seemed to please not only me, but my mother." *M.*, 20. "For years had indulged in habit of profanity; when 20 was elected teacher of country school; felt I ought to set good example to pupils; about same time the reading of the Chautauquan course set me to thinking, and led me to adopt a higher ideal; as soon as foolishness of habit was brought to my notice, I made one firm resolve and the battle was won." *F.*, 53. "When I was about 40 I tried to quit smoking, but the desire was on me and had me in its power; I cried and prayed and promised God to quit, but could not; I had smoked for fifteen years; when I was about 53 years, as I sat by the fire one day smoking, a voice came to me; I did not hear it with my ears, but more as a dream or sort of double think; it said, 'Louisa, lay down smoking;' at once I replied, 'Will you take the desire away?' But it only kept saying, 'Louisa, lay down smoking!' Then I got up, laid my pipe on the mantel shelf, and never smoked again, or had any desire to; the desire was gone, as though I never had known it or touched tobacco; the sight of others smoking and the smell of smoke never gave me the least wish to touch it again."

In these common experiences are shown all the steps of conversion, even the most unaccountable and mysterious. These facts do not explain conversion, but they do make intelligible the processes involved in the same way that all natural phenomena come to be understood. They help to make it clear that, however inexplicable, the facts of conversion are manifestations of natural processes. We accept them as mental laws because we see them working here and there and everywhere in the sphere of psychic life. Each of the above phenomena seems to be the special thing of which conversion is the general. To break a habit involves one small group of tastes, or desires and faculties, conversion takes the whole bundle of them. An awakening to one specific truth involves one faculty; the great awakening which we fitly call a second birth, is a similar awakening into larger spiritual insight. Each of the above experiences is the part of which conversion is the whole.

A General View of Conversion.

Such are the facts, as nearly completely objective as it was possible to give them. Their value is in the light they may throw on life forces and processes. It is each person's right to put his own construction on them. The following is a brief statement of the interpretation of them which has grown up during the study:

(1) *A sociological and biological view.* Conversion is primarily an unselfing. The first birth of the individual is into his own little world. He becomes conscious and self-conscious. The universe is organized about his own personality as a centre. His own will is law. His own individual insight is order. He soon finds there are other wills than his own. There is a complex, organized social will. A clash is apt to come between the self and whole. The social will is stronger, and the individual must adjust his will to it; then his sympathies follow the direction of his new insight, and he transfers his centre of life and activity from the part (himself) to the whole (society). When he attains the power to think in abstract terms, he becomes conscious of a world order outside himself. Then he begins to feel after the reality and worth of its spiritual content. He becomes dimly conscious of its unity and its authority. He must learn to submit himself to it and be guided by a larger life outside his own. With new insight comes new beauty. Beauty and worth awaken love—love for parents, kindred, kind, society, cosmic order, truth, spiritual life. The individual learns to transfer himself from a centre of self-activity into an organ of revelation of universal being.

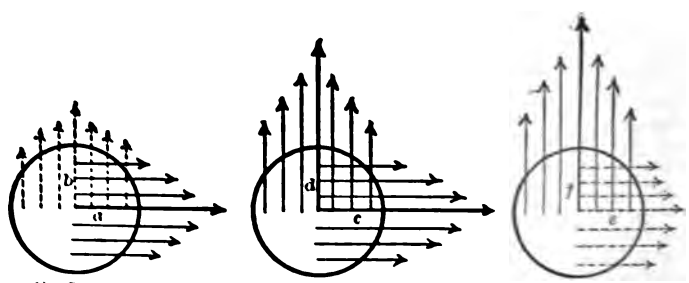
The period of adolescence is naturally the time for the awakening into the larger life. It begins with puberty. Biologically that is the period when the person begins vitally and physiologically to reach out and find his life in another. The life of two united in love, each making demands on the other, and living for each other, becomes the centre of organized life, and comes, through the family, to reflect the entire social order. Thus the advent of puberty becomes a natural doorway for entrance into the larger life outside the self. Family life furnishes the opportunity for every kind of fresh exercise of power through the necessity for providing, for defense, for growth, and the like, and brings with it an increment in the development of all the powers of one's being. We have seen that the most rapid growth of the individual is at puberty, and that the greatest increase and readjustment is in the nervous system. This reorganization of nervous tissue furnishes the basis of new insight, the means of appreciation of the larger spiritual world.

(2) *The physiological view.* It is pretty well known that the quality of mind is much dependent on the fineness of nervous structure. The child has about as many nerve cells as the adult. They differ from those of the adult in form. Those of the child are mostly round, whereas those of the adult have often very many branches with which they connect with other cells. Nervous growth seems to consist largely in the formation of new nerve connections. The rapid growth at puberty probably means that at that time there is a great increase in nervous branching. The increased ramification of nervous tissue probably determines the ability for seeing in general terms, for intellectua grasp, and for spiritual insight. The rapid formation of new nerve connections in early adolescence may be the cause of the physiological unrest and mental distress that intensifies into what we have called the sense of incompleteness which precedes conversion. The mind becomes a ferment of half-formed ideas, as the

brain is a mesh of poorly organized parts. This creates uncertainty, unhappiness, dejection, and the like, because there is not the power of free mental activity. The person is restless to be born into a larger world that is dimly felt. Finally, through wholesome suggestions or normal development, order comes and the new world dawns. Often some emotional stress or shock strikes harmony into the struggling imperfection and truth comes like a flash.

(3) *The psychological view.* Seen from the standpoint of what was designated "consciousness" earlier in the paper, conversion becomes the sudden readjustment to a larger spiritual environment when once the norm has been lost, or when it is dimly felt, but not yet attained. In answer to the question, "What acts or faults have you committed which you knew at the time were wrong; why did you do them?" there were several replies. The wrong acts performed knowingly were of two classes: first, those in which some immediate desire was stronger than a remote truer one, and secondly, those in which associations and social complications led the person against his or her private judgment into a wrong course. The last class was strongly mixed with personal imperfections, such as natural willfulness, abnormal tastes, and native inertia. These, and perhaps other causes, tend to lead one away from the straight, middle way. When once one has gone wrong, the force of habit, pride in self-direction, etc., tend to make the life persist in its own course and to resist any forces which would throw it into a better way. The conflict between the accepted course and the truer one which is pressing for recognition through the dawning of fresh truth, or through the influence of organized social life, creates those disturbances in the individual which can only come to rest through a readjustment of his life, often sudden and eruptive, into harmony with the new demands or new truth. If the normal life were represented by a straight line, that actually chosen would be a line starting in the same direction, but swerving to one side. The individual pushes on in his own course until dissipation of power and physical and mental exhaustion make it necessary to surrender the old self for a larger one. If the straight line representing the norm were one side of a triangle, the way actually pursued would be represented by the other two sides.

Something like what seems to take place at conversion is shown in Figure VI. In No. (1) of the figure the lines going in the direction (*a*) represent the way old habits, associations, tastes and ideas



(1) Conviction. (2) Crisis. (3) New life.

FIGURE VI.

tend to carry the current of life. Lines going in the direction (*b*) are the beginnings of a possible better life,—purer associations, coöperation with others, regard for future interests, ideals held up by the church, love of truth, a glimpse into a larger spiritual world beyond the self. Thus the even flow and harmony of life are destroyed. The person is pulled in two directions. This conflict between the old habitual self and a possible better one results in those conviction phenomena described as the sense of sin and the feeling of incompleteness. As the call toward the new life becomes more urgent, the situation is shown in No. (2) of the figure. (*c*) is the habitual self striving with all its might to preserve its self-consistency. (*d*) is the divine urging which has become imperative and irresistible. Here is the critical point, the tragic moment. The subject resorts to evasion of good influences, pointing out the perfection of the present self, the imperfections of others, and anything to preserve the old self intact. It is more often a distress, a deep undefinable feeling of reluctance, which is perhaps a complex of all the surface considerations which a thorough break in habits and associations would involve. He continues until complete exhaustion takes away the power of striving; he becomes nothing; his will is broken; he surrenders himself to the higher forces that are trying to claim him; he accepts the higher life as his own. The next stage is shown in No. (3). Only a vestige of the old life (*e*) is left. The new self (*f*) is now the real self. The conflict has ceased and there is relief. The depression has gone and gives place to joy. The pain from friction between contending forces becomes now the pleasure of free activity. Harmony is restored, and there is peace. The facts in the preceding study nearly all seem to fit into such a scheme. The phenomena up to the change itself have been sufficiently discussed. The various things given as essential in the change become more clear. "Self-surrender" and "new determination" seem at first entirely contradictory experiences, which often follow the same conviction states and precede similar post conversion phenomena. They are really the same thing. Self-surrender is seeing the change in terms of the old self; determination sees it in terms of the new. Each overlooks, for the time, one fact,—self-surrender, that the essential part of the old enters the new, and that really nothing is given up, and on the other hand determination does not stop to estimate the quality of its losses. The frequent phrase, "determined to yield," stands half way between and expresses, perhaps, more nearly the truth of the process. Where the change is attributed to "divine aid," the new forces which come to lead into a larger life are entirely objectified and become the influence of some outside personality or spirit. "Forgiveness" involves the same tendency to objectify the forces at work, and also the sense that the old life is no more—has been forgiven. "The feeling of oneness" (with God or Christ) is the experience in which the most prominent thing which presents itself at the time is the sense of freedom and harmony that follows the change, and the consciousness that the life is now the completer embodiment of the larger spiritual world. "Public confession" is much the same as oneness with God. To the nature which has not yet grown into the power of deeper intuitions, the sanction of friends, compliance with church rites, and the like, stand more distinctly for oneness with God. The same person more highly developed might have described the central thing in a similar experience as harmony with the will of God. The experiences immediately following conversion, called theologically "regeneration," are such as would naturally come after the steps described.

Psychologically they are in line with the phenomena of fatigue and rest, of repression and free activity.

(4) *Pedagogical view.* The differences between the male and female and revival and non-revival cases lead to some definite pedagogical inferences. In the first place, the custom of some religious bodies of working toward a distinct break in the life and a sudden awakening to a higher life is in line with something entirely normal in human nature, and which often comes spontaneously in the natural growth of the individual. Especially in the case of persons who have gone far astray, or who lack self-reliance and need the stimulus of outside influences to escape an imperfect way. For such instances, the methods conventionally used seem altogether wholesome. It is a matter for the most serious consideration, however, how the helpfulness of the revival service can be kept and its disadvantages avoided. It is significant that of the whole number of cases studied, only two or three of those who had been through revival experiences spoke in unqualified terms of approval of the usual methods employed. There were a few of the number who condemned them severely. There was a general deprecation of the emotional pressure usually exerted, and this coming from the converts themselves should be of value. We have seen that the average age of revival conversions is considerably less than the non-revival, which shows they have been hurried. There is every evidence that many of them have been hastened unduly. Many were left out of the study because they had clearly been forced into compliance with what they were not ready intelligently to accept. They were pulled green and withered. It was especially true in the case of sensitive girls who were carried away by the excitement, and afterward awakened to the fact that it was not a true experience. It is like pulling away the folds of a growing bud to disturb unduly the tender unfolding of religious nature. The greatest difficulty seems to be that the hardened natures who need the help of violent methods for restoration are the last to respond, and meanwhile much harm is done to those who are receptive and responsive to finer influences. Unless the person is ready for a change, the results of hastening conversion are apt to be temporary and soon followed by relapse. We have seen that "backsliding" much more often occurs after revival experiences than after the others. The question is, how can we preserve the essential things in revivals, and at the same time escape their evil effects? How can the uninterested be led to identify themselves with righteousness, and the wayward be reclaimed without harm to those who least need the influence of revival tactics? A few things are suggested by the study, which can only be most briefly hinted. People should be dealt with as individuals as far as possible instead of in masses. Still, the force of the ensemble should be preserved in furnishing the necessary stimulus to carry the "seeker" out of his slough. The higher motives should be appealed to more and the lower ones less. It is doubtless entirely out of proportion that one-third of the subjective forces present at conversion were self-regarding (mostly fears), while the number of distinctively altruistic motives were only one-third as frequent as the self-regarding. The lower ones should, of course, not be neglected. If a person has become an habitual transgressor of right, it is not only pedagogical, but true to the facts of life to bring him squarely to face the evil consequences of his ways, and to feel the awful authority of the moral and spiritual order. But conversion means unselfing, the entrance into a new life of insight and love, and the wise teacher will naturally hold up those incentives which

are in direct line with the new life. If men were reached more on their God side, the possibility of lifting them into a higher life would be greater and the results more permanent. The consciousness of the influence of wholesome teaching and high example is painfully absent in the cases studied. The love of God and Christ, which is supposed to be central in Christian theology, almost never appears. Exactly what the person needs who is struggling in haze and darkness and uncertainty is to have the mind clarified, to have the ragged bits of awakening consciousness struck so they may organize themselves in the direction of some high ideal, instead of in a chance or haphazard manner. It cannot be discussed here how these demands can be met practically, but they are of too great importance to be disregarded. It is necessary that we understand more fully the processes involved in conversion to adequately meet the needs of human nature. For example, it will appear from the preceding study that often when adolescents are in the throes of conviction, what is needed rather than excitement and emphasis of sin is treatment purely physiological and sanitary.

It must be evident that conversion is not a matter for the churches alone. It is under certain conditions a vital, normal step in individual growth. We have seen that all the phenomena of conversion show themselves everywhere in the psychic life. They should be accepted and utilized as belonging to growth. Each step is of frequent occurrence in common life. Sudden awakening to specific definite bits of truth are accepted as natural. We shall learn not only to anticipate, but to bring about such conditions as will foster an awakening of the whole being to larger insight. It is not a surprise that a habit should be broken and never return. It is perhaps even more natural and easy that the whole group of tastes, desires and habits which make up a character should be radically changed. It is easier to take the whole skein than to extricate one tangled thread. That conversion is deep and central in human nature we know, because it appeals, as we have seen, to the most primal instincts; we know, that its central laws are in accordance with well recognized biological principles, and that in its results it is an awakening to the highest ethics. It should be recognized as never before that a birth into new life is something that belongs to human nature. The old cult has been narrowed and abused. Consequently it has been dropped by many of our so-called liberal churches, and is willfully neglected in psychology and education. It needs to be saved from its narrow uses, and its truth refined, broadened, deepened and utilized. When restored it may have little likeness to its old forms, but will incorporate their essential truth and the wisdom which psychology and experience may be able to furnish.

The fuller discussion of the nature of conversion can be better presented after organizing the returns to section B of the syllabus in regard to gradual growth. It appears, so far, that the essential processes of conversion are quite in harmony with well recognized psychological laws, and that in its results it agrees with the truest ethics and with the tenets of the leading faiths of the world. It is the birth of the individual out of self into a larger spiritual world in which he finds his life. It is the individual will coming in harmony with the Divine Will.

The foregoing study is a modest beginning of what aspires to become a psychological study of the religious consciousness. In this time when the empirical methods of study are being so successfully applied to every department of research, and have at last reorgan-

ized our knowledge of the psychic life, it seems a most natural step that they should also help to increase our insight into the laws of the spiritual life. If the reader has found the preceding pages helpful, no farther explanation is necessary of the methods to be used, or the purpose in view. It is the intention to carry the same methods into the study of several other related topics. Before such an end can be successfully attained, it is necessary that sufficient raw material be accessible to make generalizations safe and illuminating. For the accumulation of such data the writer is almost entirely dependent on the coöperation of those who are sufficiently interested to take the time and pains to give their assistance. The facts for the foregoing study were collected by continued effort during three years. The energy that is used in getting together such material might be spent in the actual study if only it were more clearly seen that the motive behind the research is primarily in the interest of religion; for then all earnest people would be glad to coöperate. An urgent appeal is hereby made to any who are willing to assist farther in this or in the later topics by furnishing facts out of their own experience, or that have come under their own observation, to send in their names immediately to the writer, and questionnaires will be sent as the facts are wanted. His address for the present college year will be Clark University, Worcester, Mass. Many more answers are needed to section A of the present syllabus. There are many dark problems still that want farther discussion in regard to sudden conversion and confirmation. Especially are answers wanted to section B on gradual growth, the returns from which are now in process of organization. Perhaps it will be regarded as a slight compensation for their pains that copies of the results will be furnished to any who are willing to assist in getting together the facts. But the study is undertaken almost purely in the interest of both science and religion, and must depend on the unselfish help of those who are interested.

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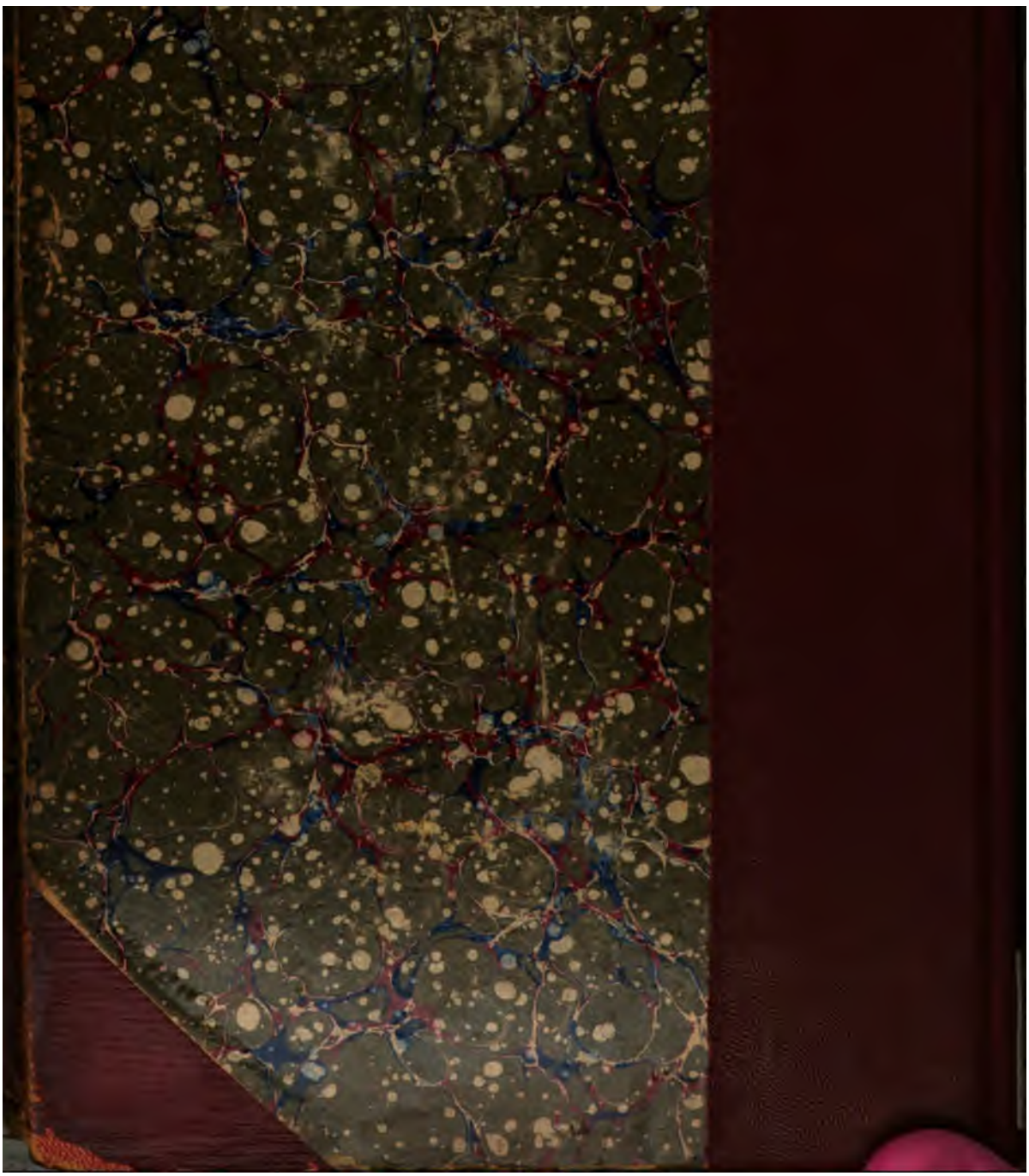
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